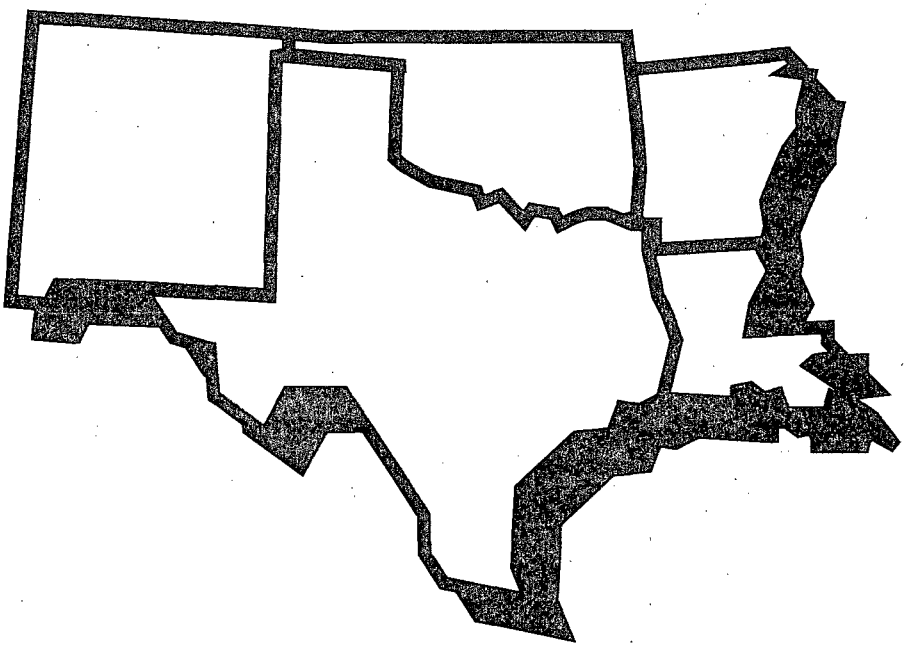
RESPONSE ACTION CONTRACT

United States Environmental Protection Agency Region 6

Contract No. 68-W6-0036

Revised Work Plan
Diamond Head Oil
December 11, 2002

Work Assignment No. 112-RICO-02KK
DCN 02-4664
Volume I of II



CH2MHILL

In Association With:
Science Applications International Corporation
Geo-Marine, Inc.

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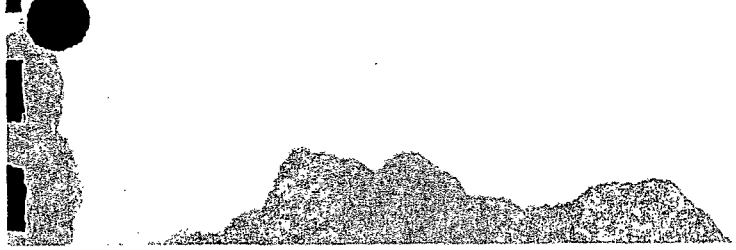

Revised Work Plan

Diamond Head Oil
Remedial Investigation/Feasibility Study
Volume I of II

Response Action Contract No. 68-W6-0036
EPA Work Assignment No. 112-RICO-02KK
CH2M HILL Project No. 173044
DCN 02-4664

Prepared for:

U.S. Environmental Protection Agency

Prepared by:

CH2M HILL, INC.

December 11, 2002

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Figures

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Acronym List

95% UTL	95 Percent Upper Confidence Limit
ARAR	Applicable or Relevant and Appropriate Regulations
AST	Above Ground Storage Tank
CFAM	Contract Financial Administrative Manager
CLP	Contract Laboratory Program
CO	Contract Officer
COC	Chain of Custody
COPC	Constituent of Potential Concern
CRP	Community Relations Plan
DCMC	Defense Contractor Material Command
DESA	EPA Division of Environmental Science and Assessment
DMP	Data Management Plan
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	US Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESI	Expanded Site Inspection
FI	Field Investigation
FIT	Field Investigation Team
IDW	Investigation Derived Waste
FTL	Field Team Leader
FS	Feasibility Study
FSP	Field Sampling Plan
GPS	Geographical Positioning System
HHRA	Human Health Risk Assessment
HMDC	Hackensack Meadowlands Development Commission
HSP	Health and Safety Plan
IRIS	Integrated Risk Information System
IS	Identification and Screening of Removal Alternatives
LNAPL	Light Non-Aqueous Phase Liquid
LOE	Level of Effort
MPR	Monthly Status Report
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
ODC	Other Direct Cost
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
PCR	Property Control Representative
PCE	Project Controls Engineer
PGM	Program Manager
PM	Project Manager
PO	Project Officer
PP	Project Planning and Support
PPM	Parts Per Million
PR	Purchase Requisition
PRG	Preliminary Remediation Goal
PSE&G	Public Service Electric & Gas
QAPP	Quality Assurance Project Plan

QMP	Quality Management Plan
RA	Risk Assessment
RAC	Response Action Contract
RI	Remedial Investigation
ROD	Record of Decision
RTL	Review Team Leader
SAP	Sampling and Analysis Plan
SMP	Site Management Plan
SOP	Standard Operating Procedure
SOW	Statement of Work
SSL	Soil Screening Level
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TM	Technical Memorandum
USACE	US Army Corps of Engineers
VOC	Volatile Organic Compounds
WA	Work Assignment.
WACR	Work Assignment Close Out Report
WAM	Work Assignment Manager
WBS	Work Breakdown Structure
WP	Work Plan
WPRR	Work Plan revision Request

Section 1
Introduction

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Section 1
Introduction

CH2M HILL is submitting this Revised Work Plan (WP) to the U.S. Environmental Protection Agency (EPA), Region 2, in response to Work Assignment (WA) No. 112-RICO-02KK under CH2M HILL's Response Action Contract (RAC) No. 68-W6-0036 with EPA Region 6. This term form work assignment authorizes CH2M HILL to perform Remedial Investigation/Feasibility Study (RI/FS) work activities related to remediation of the Diamond Head Oil site in Kearny, New Jersey.

This Work Plan is based on the following:

- Statement of Work (SOW) dated February 1, 2002, prepared by EPA Region 2 and amended May 30, 2002, for the project.
- Visits to the site by EPA Region 2 and CH2M HILL on May 15, 2002, and subsequently by CH2M HILL on May 24, 2002, to review site conditions and select sampling locations.
- Scoping meeting between EPA Regions 2 and 6 and CH2M HILL on May 22, 2002.
- Hazard Ranking System Documentation Package, Diamond Head Oil Refinery Division, Kearny, Hudson County, New Jersey; CERCLIS ID No. NJD092226000, July 2000.
- Final Draft Site Inspection Report, Diamond Head Oil Refinery Division, Kearny, New Jersey, December 31, 1991.
- Results of Expanded Site Inspection conducted by Weston, October 1999.
- Aerial Photographic Analysis of Diamond Head Oil Refinery Division, Kearny, New Jersey, January 2002.
- EPA comments (October 4, 2002) and CH2M HILL's response to comments (October 18, 2002).

Background

Site History

The Diamond Head Oil Refinery Site is a former oil reprocessing facility, which was in operation from February 1, 1946 to early 1979. During facility operations, multiple aboveground storage tanks (ASTs) and possibly underground pits were used to store oily wastes. These wastes were intermittently discharged directly to adjacent properties to the east and the wetland area on the south side of the site, creating an oil lake. The following three areas of operations, which may act as

continuing sources of site contamination and the outlines of which are currently still visible at the site, developed over the years of site operation are as follows:

- A landfill – with an approximate area of 7 acres
- The oil reprocessing section of the site – with 2 buildings, multiple ASTs, drum storage areas, and possibly underground pits
- An oil lagoon –with an approximate area of 5 acres located over the south section of the site and extending outside the site boundaries to the east and south

In 1968, the New Jersey Department of Transportation (NJDOT) acquired the property to the south of the site, and in 1977, when beginning construction of Interstate 280 (I-280), reportedly removed nine million gallons of oil-contaminated water and five to six million cubic yards of oily sludge from the oil lagoon. It is also reported that during the I-280 construction, an underground "lake" of oil-contaminated groundwater was found extending from the eastern limits of the I-280 right-of-way to Frank's Creek to the west of the site. During the process of constructing I-280, the entire oil lagoon was apparently filled, as it no longer appears on post I-280 construction-aerial photographs. There is no information on the oil and sludge removal from the lagoon and whether the excavation was completed to the native soils prior to filling or whether a sludge layer was left at the bottom of the lagoon.

From the close of operations in 1979 until 1982, the abandoned site was not completely fenced. During this time, it was reported that dumping of oily wastes and other debris took place at the site. Eastern Chemical Co. was hired to clean up the site in May 1982. In order to do so, the materials in the tanks were analyzed and found to contain polychlorinated biphenyls (PCBs) at a concentration of 206 parts per million (ppm). Subsequent analyses of the same materials revealed the presence of PCBs at concentrations of over 3,300 ppm. Approximately 7,500 gallons of materials were apparently pumped out of the tanks and disposed off site. In the same time frame, an additional 27 tons of contaminated soil were apparently removed from the site. Finally, aerial photographs from 1982 show that the reprocessing infrastructure of the site had been dismantled.

The current owner of the site is the Hackensack Meadowlands Development Commission (HMDC); HMDC's preliminary long-term plans are to develop the site for an office building.

Site Location and Setting

The Diamond Head Oil Refinery Site is currently inactive and consists of approximately 15 acres of undeveloped land located near the Hackensack Meadowlands. Figure A located in Appendix B of Volume I, shows the location of the site. Figure B located in Appendix B of Volume I is a site plan, which also shows the locations where samples were collected during the last two site investigations. The property is currently owned by the Hudson Meadows Development Corporation.

The site is bordered on the north by Harrison Avenue, on the east by the entrance ramp of I-280, on the south by a drainage ditch bordering I-280, and on the west by a salvage operation. The area surrounding the site is industrial; there are no residential areas in the vicinity of the site. A well survey performed as part of the Hazard Ranking System Documentation Package concludes that there are no public supply wells within four miles of the site.

The site is flat over the east section – where the former reprocessing area /lagoon were located and over the west section between the landfill and the Public Service Electric and Gas (PSE&G) right-of-way. A change in elevation of approximately 10 to 15 feet above the east and west sections of the site demarcates the boundary of the former landfill.

At the time of the site visit, standing water was present over small areas in the east section of the site although there was evidence of flooding over larger portions of the site. The ground in those areas was noted to be soft. There was no apparent sheen on the standing water.

An oil sheen was seen along the bank of the drainage channel immediately downgradient of the site at the south border of the PSE&G right-of-way. There was no sheen on the water in the channel, which appeared not to be flowing.

Approximately 70 percent of the site is currently covered by Phragmites up to 12 feet tall, which make access difficult. On aerial photographs from 1990, a wetland area is observed to have developed in the southern section of the site where part of the former lagoon was located and had been filled during the construction of I-280. A wetland delineation study performed in 1990 and included in the Hazard Ranking System Documentation Package for the site confirmed the presence of two small wetland areas in the southern portion of the site. The study concluded, however, that the previous historical degradation of the site has severely affected the limits and the quality of these habitats. One of the wetland areas is completely surrounded and impacted by fill with the other area

displaying similar disturbance and utilized primarily as a drainage swale for I-280 and surrounding street and industrial property runoff. There are currently no markings at the site to indicate the limits of these wetland areas.

Geologic and Hydrogeologic Information

Site geology (based on several shallow borings installed at the site during previous investigations) consists of varying thickness of fill materials overlying native sands and clays. A layer of peat and/or organic silt and clay is present in most borings at 14 to 18 feet below the ground surface. The groundwater table is shallow at approximately 1 to 2 feet below the ground surface. Previous investigations conducted at the site suggest that groundwater flow is to the west. At the time of the site visit, free product 0.6 feet thick was present in monitoring well MW-3 located in the former lagoon area; product had also been noted in this well during previous investigations conducted at the site. Two other wells MW-5 in the landfill area and MW-2 in northeast portion of the site were checked for free product during the site visit and were found not to contain free product.

Previous Investigations

Available information indicates that four previous investigations have been conducted at the site including a sampling event conducted by the New Jersey Department of Environmental Protection (NJDEP), an Environmental Site Characterization conducted by Killam Associates, and two Site Inspections conducted by EPA's Region 2 Field Investigation Team (FIT). During these investigations, groundwater, surface water/sediment, surface/subsurface soil, liquid waste, and solid waste samples were collected. Analytical results of these samples indicated the presence of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, and metals. Brief descriptions of the scope of these investigations and how the collected data will be used during the RI/FS process are provided below.

NJDEP – 1985

In 1985, NJDEP collected six surface soil and two surface water samples, which all indicated the presence of a variety of organic contaminants and metals. The locations where the samples were collected are unknown, the analyses were not performed through the EPA Contract Laboratory Program (CLP), and the data were not validated. Because of this, the results of this sampling event

were used to indicate the presence of contamination at the site and to assist in developing the scope for this remedial investigation but will not be used to perform the ecological and human health risk assessments or to support the RI/FS decision-making process.

Killam Associates – 1990

Killam Associates performed a remedial investigation for HMDC in 1990. The investigation consisted of installing five soil borings and five wells (MW-1 through 5) at the site and associated soil and groundwater sampling. Two surface water samples were also collected. The locations where the samples were collected are unknown, the analyses were not performed through the EPA CLP, and the data were not validated. Because of this, the results of this sampling event were used to indicate the presence of contamination at the site and to assist in developing the scope for the remedial investigation but will not be used to perform the ecological and human health risk assessments or to support the RI/FS decision-making process.

Killam also completed a surface geophysical survey. Utilizing an EM-31 instrument, measurements were collected at 25-foot intervals over a 100-foot grid. The results did not indicate areas of buried metal. Killam Associates also performed a soil gas survey utilizing both an Organic Vapor Analyzer (OVA) and an HNU. The results of the survey indicated the predominant presence of methane across the entire site with the soil gas in isolated areas containing VOCs.

EPA 1991 Site Inspection

As part of a 1991 Site Inspection, EPA collected four groundwater, three surface water, three sediment, seven surface soil, one subsurface soil, three liquid waste, and two solid waste samples. Although the exact locations are unknown, the general locations of the conducted sampling are known. Samples were analyzed for Target Compound List (TCL) organics and Target Analyte List (TAL) metals and indicated the presence of both organic contaminants and metals at the sampled locations.

The analyses were performed by EPA CLP laboratories and the results were validated. The actual laboratory packages were not available at the time of the preparation of this Work Plan but will be obtained, reviewed to determine the quality of the data and its usability, and used to perform the ecological and human health risk assessments and support the RI/FS decision-making process.

Although the exact sampling locations are unknown, the general area where the samples were collected is known. Since the site has been subject to filling and grading, contamination within a general area (e.g., landfill area, former reprocessing facility area) is expected to be the similar. Additional survey information for the sampling points would improve the usability of the data.

EPA 1999 Expanded Site Inspection

In December 1999, EPA conducted an Expanded Site Inspection (ESI) at the site where EPA installed 20 soil borings within the reprocessing/lagoon section of the site. Samples were collected from 0 to 2 feet and at a lower depth within each boring. EPA also collected 15 sediment samples from the on site wetland areas as well as 3 samples from an off site wetland area, which may be representative of background conditions. The general locations of the on site samples are shown on Figure B located in Appendix B of Volume I. Three groundwater samples and samples from the product in well MW-3 were also collected. The samples were analyzed for TCL organics and TAL metals and indicated the presence of both organic contaminants and metals at the sampled locations.

All analyses were performed by EPA CLP laboratories and the results were validated. Although the laboratory packages for the soil data were not available at the time of the preparation of this Work Plan, the laboratory packages for the sediment samples were available and determined to be of useable quality subject to the assigned validation qualifiers. The soil results of the 1999 ESI will be obtained as part of the RI/FS and reviewed to determine the quality of the data and its usability. All 1999 data will then be used to perform the ecological and human health risk assessments and support the RI/FS decision-making process. Although the exact sampling locations are unknown, the general areas where the samples were collected are known. Since the site has been subject to filling and grading, contamination within a general area (e.g., landfill area, former reprocessing) is expected to be similar. Additional survey information for the sampling points would improve the usability of the data. Attempts are being made to obtain this information from the contractor who performed the ESI.

Purpose and Scope

The broad objectives of the RI/FS for the Diamond Head Oil Refinery Site are to obtain data on the nature and extent of soil, groundwater, surface water, and sediment contamination associated with the site, assess the associated human health and ecological risks, and evaluate appropriate remedial alternatives.

To meet these overall objectives, the Diamond Head RI/FS will be performed in two phases. A Phase 1 remedial investigation will be performed to obtain information on contamination in areas of the site where there is currently no information; to delineate the extent of the light non-aqueous phase liquid (LNAPL) that is currently found in monitoring well MW-3 in the former lagoon area; and to investigate groundwater conditions at the upgradient and downgradient boundaries of the landfill and at the upgradient and downgradient boundaries of the site. The results of the Phase 1 investigation will then be used to determine whether a Phase 2 investigation is needed and to develop its appropriate scope. For example, during Phase 2, it may be appropriate to divide the site into two operable units: one for further investigation and delineation of on site contamination and the second for investigation of off site groundwater contamination.

The specific objectives for the Phase 1 investigation are outlined below. Because the objectives of the Phase 2 investigation will depend on the Phase 1 results, the Phase 2 objectives listed below are preliminary and will be modified based on the results of the Phase 1 investigation.

Objectives of the Phase 1 Investigation

- Delineate the on site extent of the LNAPL and associated soil contamination in the former lagoon area and characterize the LNAPL material.
- Investigate soil contamination (surface and subsurface, above and below the peat/native organic soil layer) in areas where data are not available from previous investigations.
- Investigate soil contamination (surface and subsurface, above and below the peat/native organic soil layer) along the boundaries of the landfill.
- Investigate groundwater contamination along the upgradient and downgradient boundaries of the site and along the upgradient and downgradient boundaries of the landfill. Groundwater quality will be investigated above and below the peat/native organic soil layer.
- Investigate surface water and sediment contamination in areas of the site where data are not available from previous investigations and immediately downgradient from the site.

Preliminary Objectives of the Phase 2 Investigation

- On Site Investigation – Supplement the Phase 1 results and collect additional information - only where needed – to meet the established Phase 2 objectives. Specific objectives may include delineating the extent of contamination identified during Phase 1 (e.g., investigating conditions

within the landfill boundaries), investigating groundwater hydrogeologic conditions, and investigating further groundwater conditions beneath the peat/native organic soil layer.

- Off Site investigation - Delineate the extent of any groundwater contamination plume identified to originate from the site based on the Phase 1 results.

The approach for developing this RI/FS Work Plan follows the phased approach discussed during the scoping meeting on May 22, 2002, and subsequently defined in WAF No. 02 dated May 29, 2002 and authorized by the Contracting Officer (CO) on May 31, 2002. Specifically, this Work Plan describes the investigation activities planned during the Phase 1 investigation. At the end of the Phase 1 investigation, a Technical Memorandum (TM) will be prepared presenting the Phase 1 results and recommending more specific objectives and scope for the Phase 2 investigation. After EPA review and approval of the Technical Memorandum, the objectives and scope for the Phase 2 investigation will be developed in a Phase 2 Work Plan Revision Request (WPRR).

The Phase 1 investigation includes the following SOW tasks:

Task 1 Project Planning
Task 2 Community Relations Involvement
Task 3 Remedial Investigation
Task 4 Sample Analysis
Task 5 Analytical Support and Data Validation
Task 6 Data Evaluation
Task 7 Assessment of Risk
    Human Health Risk Assessment – partial based on the Phase 1 results
    Ecological Risk Assessment – partial based on the Phase 1 results

The scope of the Phase 1 remedial investigation developed to meet the established Phase 1 objectives is summarized in Table D. Tables E and F list the samples that are planned to be collected for analysis through and outside of the CLP program, respectively.

Work Plan Organization

This Work Plan is assembled in two volumes. Volume I presents the technical assumptions and summarizes the resulting estimated cost and schedule to perform the Phase 1 tasks described in the SOW. Volume I is organized into the three sections described below:

- Section 1 provides background information and presents the project team selected to perform the work.
- Section 2 summarizes our approach to the work.
- Section 3 presents an estimate of the level of effort (LOE) for each task, the anticipated schedule for completion of each task, and the WA deliverables.

Volume II, bound separately, contains confidential business information including CH2M HILL's detailed budget. A cost summary table as prescribed by FAR 15.408, and detailed pricing reports are provided as part of the confidential business information presented in Volume II.

Project Team Organization

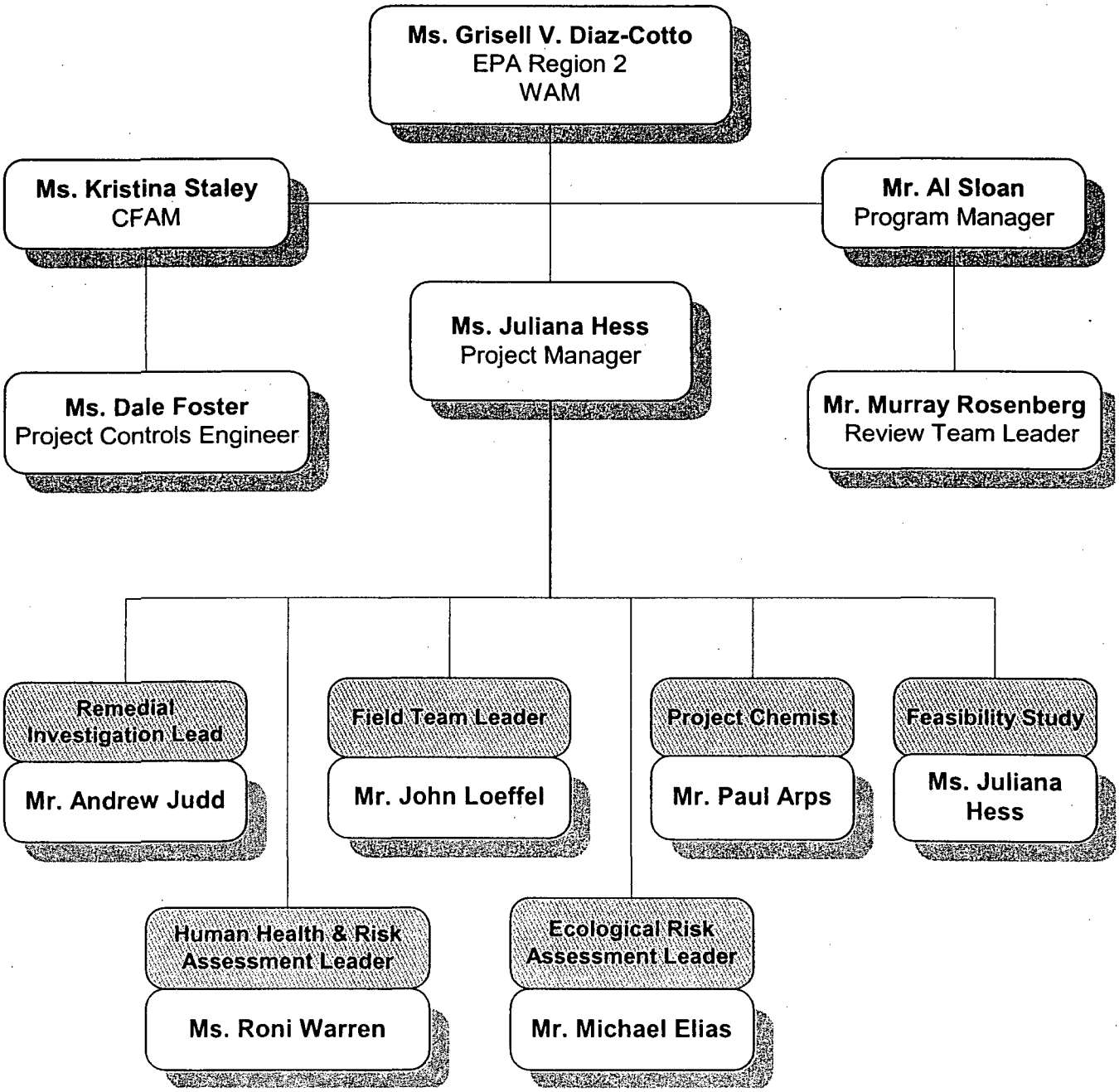
EPA Region 2 has identified Ms. Grisell V. Diaz-Cotto as the EPA Work Assignment Manager (WAM) for this WA. Ms. Diaz-Cotto will interact directly with EPA Region 6 for contract administration, which will be provided by Mr. Tom Reilly, Project Officer (PO), and Ms. Cora Stanley, CO, respectively. Ms. Juliana Hess is proposed as CH2M HILL's Project Manager (PM) for the WA. Ms. Hess is located in CH2M HILL's Parsippany, New Jersey, office. Ms. Hess will be assisted by CH2M HILL's RAC 6 Program Support staff, led by Mr. Al Sloan, Program Manager (PGM) and Ms. Kristina Staley, Contract Financial/Administrative Manager (CFAM). CH2M HILL's Program Support staff are located in Dallas, Texas.

Ms. Hess will be supported by a team of technical specialists selected for their qualifications in each of the tasks identified for this WA. The technical team will include Mr. Andrew Judd, Remedial Investigation Lead; Ms. Roni Warren, Human Health Risk Assessor; Mr. Michael Elias, Ecological Risk Assessor; and Mr. Paul Arps, Project Chemist; Mr. John Loeffel will serve as Field Team Leader (FTL). Ms. Hess will serve as the Feasibility Study Lead. Ms. Dale Foster, Project Controls Engineer (PCE), will provide financial and schedule project controls support. All of the key team members have experience working on RAC 6 WAs. Organization of the project team is illustrated in Figure 1-1.

Quality Control Measure

As is the case for all RAC 6 technical WAs, the project team will be supported by a review team led by a Review Team Leader (RTL). The proposed RTL for this WA is Mr. Murray Rosenberg, a senior hydrogeologist and PM with over 17 years of experience in remedial investigations and feasibility studies. Mr. Rosenberg and other review team members will be responsible for reviewing major project deliverables prior to submittal to EPA. Team members will also serve as a technical resource to the project team throughout the duration of the WA on an as-needed basis for each task. These activities will occur per the quality management system described by the CH2M HILL Quality Management Plan (QMP) provided in the RAC 6 Standard Operating Procedures, submitted to EPA Region 6 in October 1994.

Figure 1-1
Diamond Head Oil
RI/CO
Organizational Chart



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Section 2
Remedial Investigation/Feasibility Study

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Section 2
Remedial Investigation/Feasibility Study Oversight

This section describes the tasks that will be performed during the Diamond Head Oil Refinery Site RI/FS under WA No. 112-RICO-02KK. The specific tasks and subtasks to be performed are described in the WA SOW and are listed in Table 2-1. Also listed in the table is the CH2M HILL Work Breakdown Structure (WBS) that will be used to manage the assignment. This Work Plan describes the activities to be performed under the lowest subtask level listed in Table 2-1; CH2M HILL's technical approach to achieving the SOW requirements for each subtask; our estimate of labor hours; the deliverables that will be produced; and the travel, subcontractor pool, other direct costs, equipment rental, and consumable materials that would be needed in support of the identified subtask activities. Latest EPA guidance documents will be used at all times during the execution of this WA.

Table 2-1
Project Work Breakdown Structure

Task / Subtask Name Designator	SOW Task No.	CH2M HILL WBS
Task 1 Project Planning and Support (PP)		**PP**
1.1 Project Planning	***1.1***	***PPWP***
1.1.1 Attend Kickoff/Scoping Meeting	1.1.1	PPWP010
1.1.2 Evaluate Existing Information	1.1.2	PPWP020
1.1.3 Conduct Site Visit	1.1.3	PPWP030
1.1.4 RI/FS Work Plan	1.1.4	PPWP040
1.2 Preparation of Site-Specific Plans	***1.2***	***PPSP***
1.2.1 Develop Site Management Plan	1.2.1	PPSP010
1.2.2 Develop Health and Safety Plan	1.2.2	PPSP020
1.2.3 Develop Sampling and Analysis Plan	1.2.3	PPSP030
1.3 Project Management	***1.3***	***PPPM***
1.3.1 Prepare Monthly Status Reports	1.3.1	PPPM010
1.4 Procurement of Subcontractors	***1.4***	***PPSU***

Table 2-1
Project Work Breakdown Structure

Task / Subtask Name Designator	SOW Task No.	CH2M HILL WBS
1.4.1 Identification and Procurement of Subcontractors	1.4.1	PPSU010
1.4.2 Develop Subcontractor QA/QC Program	1.4.2	PPSU020
1.4.3 Perform Subcontractor Management	1.4.3	PPSU030
Task 2 Community Relations (CR)		**CRCR**
2.1 Community Relations Plan	2.1	CRCR010
2.2 Public Meeting Support	2.2	CRCR020
2.3 Fact Sheets Preparation	2.3	CRCR030
Task 3 Field Investigation (FI)		**FIFI**
3.1 Mobilization and Demobilization	***3.1***	
3.1.1 Identify Field Support Equipment, Supplies, and Facilities	3.1.1	FIFI010
3.1.2 Mobilization	3.1.2	FIFI020
3.1.3 Demobilization	3.1.3	FIFI030
3.2.1 Perform Site Reconnaissance	3.2.1	FIFI040
3.2.2 Conduct Geological Investigations	3.2.2	FIFI050
3.2.3 Conduct Hydrogeological Investigations (Groundwater)	3.2.4	FIFI060
3.2.4 Conduct Waste Investigation	3.2.6	FIFI070
3.2.5 Conduct Geophysical Investigation	3.2.7	FIFI080
3.2.8 Conduct Ecological Investigation	3.2.8	FIFI090
3.2.10 Dispose of Investigation-derived Waste	3.2.10	FIFI100
Task 5 Analytical Support and Data Validation (AN)		**ANAN**
5.2 Sample Management	5.1	ANAN010
5.3 Data Validation	5.3	ANAN020
Task 6 Data Evaluation (DE)		**DEDE**
6.1 Data Usability Evaluation	6.1	DEDE010

Table 2-1
Project Work Breakdown Structure

Task / Subtask Name Designator	SOW Task No.	CH2M HILL WBS
6.2 Data Reduction, Tabulation, and Evaluation	6.2	DEDE020
Task 7 Assessment of Risks (RA)		**RARA**
7.1 Human Health Risk Assessment	7.1	
7.1.1 Draft Human Health Risk Assessment Report	7.1.1	RARA010
7.2 Ecological Risk Assessment	7.2	
7.2.1 Draft Ecological Risk Assessment Report	7.2.1	RARA030

Task 1 (PP) - Project Planning and Support

(PP.PM.01) - Prepare Monthly Status Reports

Activity ID: PPPM010 Prepare Monthly Status Reports
P4: 12 P3: 204 P2: 120 P1: 0 T2: 0 T1: 0 LOE Hours: 336

Technical Approach

The PM will work closely with the RAC 6 contracts and administrative staff for financial and schedule management of the work assignment and preparation of monthly status reports (MPRs) and invoices. The MPRs will include a narrative description of the performed activities and the financial and schedule status of the project. Time for providing technical guidance and direction to the project team and coordinating the technical execution of the assignment is included in the individual subtasks.

The overall duration of the Phase 1 activities is estimated at 12 months with several project tasks overlapping during portions of this period.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Project management is estimated at 16 P3 LOE per month for the PM, 1 P4 LOE per month for the RAC 6 PGM, and 1 P3 LOE per month for the CFAM.

A PCE is estimated to require 10 P2 LOE per month for preparing the monthly project financial and schedule reports.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 12 P4 hours, 204 P3 hours, and 120 P2 hours.

Deliverables

MPRs

(PP.SP.01) - Develop Site Management Plan

Activity ID: PPSP010 Develop Site Management Plan
P4: 0 P3: 16 P2: 48 P1: 8 T2: 8 T1: 0 LOE Hours: 80

Technical Approach

This subtask includes the development of a draft Site Management Plan (SMP), which will describe management responsibilities during field activities, site access and security procedures, contingency procedures, storage of equipment and wastes, connections for utilities, and other procedures to be followed in the field. A draft SMP will be prepared and revised based on EPA comments. One site visit is included under this subtask to select the locations for all field facilities.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Development of the draft SMP will require 40 P2 LOE; review and coordination of plan preparation will require 8 P3 LOE and drafting will require 8 T2 LOE.

The site visit for determination of the locations for the various field facilities and associated management procedures will require 8 P2 and 8 P1 LOE.

Revising and finalizing the plan based on EPA comments and submission of the final SMP will require 8 P3 LOE.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 16 P3 hours, 48 P2 hours, 8 P1, and 8 T2 hours.

Travel -One site visit is included under this subtask to select the locations for all field facilities. An estimate of the travel costs is included in Table 1 of Volume II.

Deliverables

The following deliverables will be prepared during this subtask: (1) Draft SMP; (2) Final SMP

(PP.SP.02) - Develop Health and Safety Plan

Activity ID: PPSP020 Develop Health and Safety Plan
P4: 0 P3: 8 P2: 8 P1: 0 T2: 4 T1: 0 LOE Hours: 20

Technical Approach

This subtask includes the development and review of a Health and Safety Plan (HSP) for the Phase 1 RI activities.

Quantity Estimate

Labor - This subtask is estimated to require the following number of labor hours to complete: 8 P3 hours, 8 P2 hours, and 4 T2 hours.

Deliverables

HSP

(PP.SP.03) - Develop Sampling and Analysis Plan

Activity ID: PPSP030 Develop Sampling and Analysis Plan
P4: 38 P3: 189 P2: 48 P1: 150 T2: 0 T1: 0 LOE Hours: 425

Technical Approach

This subtask includes the preparation of (1) a Sampling and Analysis Plan (SAP) incorporating all the

elements of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP) into a single document, and (2) a Data Management Plan (DMP).

The following Standard Operating Procedures (SOPs) will be developed and included in the SAP:

1) Sample Nomenclature
2) Chain-of-custody Procedures
3) Field Logbook Procedures
4) Field Parameter Forms
5) Sample Bottling and Preservation (bottles, size, type, etc.)
6) Sample Labeling, Packing, and Shipping
7) Photoionization Detector
8) Combustible Gas/Oxygen/Hydrogen Sulfide Monitor
9) Water Quality Meter
10) MiniRam Meter
11) Flame Ionization Detector
12) Draeger Tubes
13) Equipment Decontamination
14) Borehole Installation (RotaSonic)
15) Borehole Abandonment
16) Design and Construction of Monitoring Wells (single and double casing)
17) Design and Construction of Piezometers
18) Development of Monitoring Wells
19) Water Level and LNAPL Thickness Measurements in Piezometers and Monitoring Wells
20) Low-flow Groundwater Sampling
21) Manual Surface and Shallow Subsurface Soil Sampling
22) Subsurface Soil Sampling
23) Collection and Preservation of Soil Samples for VOC Analysis
24) Shake Tests for LNAPL Monitoring
25) Monitoring for Tidal Influences
26) Surface Water Sampling
27) Sediment Sampling

The SAP will also establish the analytical and quality control methods that will be followed for all CLP and non-CLP analyses for the media planned to be sampled during the Phase 1 investigation:

soil, groundwater, surface water, sediment, LNAPL, and investigation derived waste (IDW).

CH2M HILL will submit a draft of the SAP for EPA review and will address comments and revise the plan.

This subtask also includes the development of a DMP. The objectives of the DMP are to describe the database and visualization software that will be used, the responsibilities and procedures for sample tracking and data entry into the database, and the expected outputs from the database (i.e., types of tables and figures and statistical analyses of the data for the human health and ecological risk assessments).

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Preparation of SOPs 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 15, 18, 20, and 23 is budgeted on the average of 2 LOE per SOP or a total of 14 P1 and 14 P3 LOE.

Preparation of SOPs 4, 5, 17, 19, 21, 22, 26, and 27 is budgeted on the average of 4 LOE per SOP or a total of 16 P1 and 16 P3 LOE.

Preparation of SOPs 1, 14, 16, 24, and 25 is budgeted on the average of 16 LOE per SOP or a total of 40 P1 and 40 P3 LOE.

Preparation of the draft SAP (including QAPP and FSP) – 80 P1 LOE and 40 P3 LOE

Senior technical support for the draft plan is estimated to require32 P4 LOE

EPA comments on the plan addressed in an addendum is estimated to require40 P3 LOE; this estimate assumes that one consolidated set of comments resolving any conflicting comments by various reviewers will be provided to CH2M HILL.

Technical coordination of plan preparation is estimated to require 33 P3 LOE.

P2 LOE is estimated for 48 hours for development of the DMP.

Senior technical support for the draft DMP is estimated to require 6 P4 LOE.

Coordination between members of the data management team to define data management process, interactions between the database and visualization tools to be used, and modifications needed in order to accommodate the needs of this project are estimated at 6 P3 LOE

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 38 P4 hours, 189 P3 hours, 48 P2 hours, and 150 P1 hours.

Deliverables

The following deliverables will be prepared during this subtask: (1) Draft SAP; (2) Final SAP; (3) Draft DMP; and (4) Final DMP

(PP.SU.01) - Identify/Procure Subcontractors

Activity ID: PPSU010 Identification and Procurement of Subcontractors
P4: 0 P3: 154 P2: 142 P1: 72 T2: 0 T1: 0 LOE Hours: 368

Technical Approach

This subtask includes administrative support for subcontract procurement including development of purchase requisitions (PRs) and solicitations, offer evaluation, oversight of selection process, and subcontract award. These award opportunities will be managed and best efforts will be made to ensure that the total amount of all awards meets the Contract's subcontracting plan goal. The PM and technical specialists will identify and/or suggest sources for all procurements. Budgets for preparation of the technical specifications, technical evaluation of the received proposals, and actual subcontract costs are included under Task 3 (FI.FI).

The following is a list of the needed subcontracts:

1) Installation of fence gate
2) Vegetation clearance

3) Surveying services
4) Boring and well installation
5) Non-CLP laboratory subcontract – soil, LNAPL, water, and IDW analyses
6) Utility clearance
7) IDW Disposal

In addition, purchase orders will be issued for the following items:

1) Field sanitary facility
2) Field trailer
3) Water cooler
4) Trash dumpster and trash removal services
5) Storage tank for RI-derived waste water
6) Storage tank for clean water
7) Monthly water delivery
8) Monthly electrical charge
9) Monthly phone charge
10) Electrical and phone connection
11) Phone, fax, printer rental
12) Computer rental
13) Ice chest
14) Field sampling equipment (consumables and rental)

A total of 21 subcontracts/purchase orders are anticipated.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

A total of 21 subcontracts/purchase orders are anticipated.

The six subcontracts, which involve on site work, will require review by a health and safety specialist to determine if the subcontractor has an established health and safety program and complies with

applicable OSHA requirements. Review of each subcontract will require on the average 2 P3 LOE per subcontract or a total of 12 P3 LOE.

LOE for administrative support for subcontract procurement is estimated on the average at 8 P1 LOE for nine subcontracts / purchase orders and 8 P2 LOE per subcontract for ten subcontracts / purchase orders. The drilling and waste disposal subcontracts are estimated to require each 40 P3 LOE.

The Project Manager and RI Lead will require 2 LOE each per subcontract/purchase order (2 P3 and 2 P2) to coordinate these activities with the administrative subcontract staff, except for the drilling and waste disposal subcontracts. These two subcontracts will require 12 LOE each from the Project Manager and RI Lead or a total of 24 P3 and 24 P2 LOE.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 154 P3 hours, 142 P2 hours, and 72 P1 hours.

Deliverables

No deliverables are included as part of this subtask.

(PP.SU.02) - Develop Subcontractor QA/QC Program

Activity ID: PPSU020 Develop Subcontractor QA/QC Program
P4: 0 P3: 180 P2: 12 P1: 0 T2: 0 T1: 0 LOE Hours: 192

Technical Approach

This subtask includes monthly monitoring of subcontract performance by the RAC 6 Subcontract Manager and a field audit by the PM and RI Lead of the boring and well installation subcontract.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Subcontractor management activities are assumed to be required for 4 months.

A total of 168 P3 LOE are estimated for subcontract management and oversight.

The Project Manager and RI Lead will require a total of 12 LOE each for the field audit (12 P3 and 12 P2).

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 180 P3 hours and 12 P2 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included in Table 1 of Volume II of this Work Plan.

Consumables/Expendables – Consumable and expendable materials must be purchased in order to implement the activities described in this subtask. Since the site visit will occur during the field investigation (FI), it is assumed that consumables are covered under that subtask.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. Since the site visit will occur during the field investigation, it is assumed that equipment is also covered under the FI task.

Deliverables

No deliverables are included as part of this subtask.

(PP.SU.03) - Perform Subcontractor Management

Activity ID: PPSU030 Perform Subcontractor Management
P4: 0 P3: 156 P2: 258 P1: 75 T2: 0 T1: 0 LOE Hours: 489

Technical Approach

This subtask includes subcontract administration and subcontract close out for the duration of the Phase 1 investigation. On-going technical oversight of subcontracts is included under Task 3 (FI.FI).

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

A total of 21 subcontracts/purchase orders are anticipated. On the average 3 LOE are estimated to be required per month per subcontract for administrative subcontract management and close out except for the drilling and waste disposal subcontracts, which are estimated to require each, on the average, 8 LOE per month.

The PM or the RI Lead will require approximately 2 LOE per month per subcontract/purchase order to coordinate subcontractor management with administrative staff except for the drilling and waste disposal subcontracts, which will require 8 LOE each per month.

Subcontractor management activities are assumed to be required for 4 months.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 156 P3 hours, 258 P2 hours, and 75 P1 hours.

Deliverables

No deliverables are included as part of this subtask.

(PP.WP.01) - Attend Kickoff/Scoping Meeting

Activity ID: PPWP010 Attend Kickoff/Scoping Meeting
P4: 3 P3: 56 P2: 4 P1: 24 T2: 0 T1: 0 LOE Hours: 87

Technical Approach

On May 22, 2002, EPA Region 6, EPA Region 2, and CH2M HILL participated in a scoping meeting at EPA Region 2 offices in Edison, New Jersey.

In preparation for the scoping meeting, CH2M HILL developed a proposed RI/FS approach and a

corresponding scope of work and handouts describing this approach. A phased approach was proposed for conducting the RI/FS at the Diamond Head site. It was also proposed that the Phase 1 work plan describe the scope of work for the Phase 1 investigation through the evaluation of the collected data. Some of the initial activities under the risk assessment task would also be completed as part of the Phase 1 work in order for their conclusions to be available when developing the approach and scope for the Phase 2 work. This approach was discussed and agreed upon during the scoping meeting.

This subtask also includes evaluating various options for investigating the presence of LNAPL at the site. The list of these options was presented at the scoping meeting and their advantages and disadvantages discussed. Finally, following the meeting, we prepared a summary of the agreements reached during the meeting.

Quantity Estimate

Labor - To accomplish the activities described above, the following number of labor hours were needed for this subtask: 3 P4 hours, 56 P3 hours, 4 P2 hours, and 24 P1 hours.

Travel -Travel to EPA offices in Edison is included to implement the activities described in this subtask. An estimate of the travel costs is included in Table 1 of Volume II of this Work Plan.

Deliverables

The following deliverables will be prepared during this subtask: (1) Handout for the scoping meeting; (2) Summary of decisions/agreements made during the meeting on the RI/FS approach and scope.

(PP.WP.02) - Evaluate Existing Information

Activity ID: PPWP020 Evaluate Existing Information
P4: 5 P3: 62 P2: 26 P1: 32 T2: 0 T1: 0 LOE Hours: 125

Technical Approach

CH2M HILL reviewed background documents and evaluated the available site information/data in order to determine their usability and whether they could be incorporated into the RI/FS process. It was determined that all data collected by EPA during the 1991 and 1999 site inspections and sample analyses performed by the EPA CLP would be used as part of this RI/FS. However, only the results of the sediment analyses from the last site inspection were available for review during work plan preparation. Information/data that were not available during work plan preparation will also need to be reviewed before a final determination can be made on their usability and incorporation into the RI/FS process.

To assist EPA in obtaining the outstanding information/data, we prepared a list of information/data needs for the contractor who had performed the last site inspection.

We also contacted the contractor to request the information on the list.

The contractor indicated that they could not provide the information without direction and funding to do this from EPA. In order to proceed with the Work Plan preparation and not delay its submittal by waiting for the outstanding information, this subtask includes LOE for CH2M HILL's future coordination with the contractor and for our review of the information/data once they become available. The final recommendation to EPA on data usability will be made after this review is completed. Entry of the 1991/1999 data into the project database and associated data evaluation will be performed as part of the data evaluation task.

Quantity Estimate

Labor - The following number of labor hours were needed to accomplish the review of the available information for Work Plan preparation: 1 P4 hours, 34 P3 hours, 6 P2 hours, and 24 P1 hours.

The following number of labor hours are estimated to be needed to coordinate the receipt and review of outstanding information/data to determine their usability and how they will be incorporated into the RI/FS process: 4 P4 hours, 28 P3 hours, 20 P2 hours, and 8 P1 hours.

To accomplish the activities listed above, the following number of labor hours are needed to complete this subtask: 5 P4 hours, 62 P3 hours, 26 P2 hours, and 32 P1 hours.

Deliverables

The following deliverable was prepared during this subtask: Request for available information/data from the 1999 site inspection. EPA has indicated that 1991 information is available in EPA's files.

(PP.WP.03) - Conduct Site Visit

Activity ID: PPWP030 Conduct Site Visit
P4: 0 P3: 20 P2: 0 P1: 12 T2: 0 T1: 0 LOE Hours: 32

Technical Approach

On May 15, 2002, the CH2M HILL PM, RTL, and FTL participated in a site visit. The site visit included monitoring the ambient air to establish baseline conditions and collecting water levels and LNAPL thickness measurements. Photographs documenting site conditions were also taken and later developed.

Quantity Estimate

Labor - Labor: The following number of labor hours were needed to complete this subtask: 20 P3 hours, and 12 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included Table 1 of Volume II of this Work Plan.

Consumables/Expendables - Consumable and Expendable materials were purchased in order to implement the activities described in this subtask. An estimate of the consumable materials costs is included Table 2 of Volume II of this Work Plan.

Equipment Rental - Equipment was rented in order to implement the activities described in this subtask. An estimate of the equipment rental costs is included Table 3 of Volume II of this Work Plan.

Deliverables

No deliverables are included as part of this subtask.

(PP.WP.04) - Develop RI/FS WP/Cost Estimate

Activity ID: PPWP040 Develop RI/FS Work Plan and Cost Estimate
P4: 0 P3: 216 P2: 100 P1: 74 T2: 0 T1: 0 LOE Hours: 390

Technical Approach

This subtask includes developing the draft Work Plan scope and associated costs, coordinating with the various technical leads, review and technical input into Work Plan development, and preparation of a project schedule. We also prepared a technical and cost comparison between the RotaSonic drilling method proposed for use during this remedial investigation and other available drilling options. An internal draft of the Work Plan and associated costs was prepared and received senior technical and program reviews before being finalized for submittal to EPA.

This subtask also includes the selection of the project team and establishing the project financial and schedule tracking system. One additional site visit occurred under this subtask to evaluate locations for the off site boring and site accessibility for the drilling equipment.

Future revisions of the draft Phase I Work Plan and cost estimate based on EPA comments are also included in the subtask. Preparation of a Phase 2 scope and WPRR are not included in this subtask.

Quantity Estimate

Labor - The LOE required to complete the draft Work Plan was 176 P3 hours, 60 P2 hours, and 74 P1 hours. The LOE estimated to be required to revise the Work Plan based on EPA comments is 40 P3 hours and 40 P2 hours.

This subtask is estimated to require the following total number of labor hours to complete: 216 P3 hours, 100 P2 hours, and 74 P1 hours.

Travel -Travel to the site is included to locate the off site boring and further evaluate site accessibility for the drilling equipment. An estimate of the travel costs is included Table 2 of Volume II of this Work Plan.

Deliverables

The following deliverables will be prepared during this subtask: (1) Draft Work Plan; (2) Final Work Plan.

Task 2 (CR.CR) - Community Relations

(CR.CR.01) - Community Relations Plan

Activity ID: CRCR010 Community Relations Plan
P4: 4 P3: 48 P2: 8 P1: 0 T2: 12 T1: 0 LOE Hours: 72

Technical Approach

CH2M HILL will develop a Community Relations Plan (CRP) for the Diamond Head RI/FS based largely on typical public concerns associated with remedial investigations. The plan will include a description of the history, past investigations, and known contamination at the site, a summary of the planned RI/FS activities and their general schedule, a list of project contacts, and a list of City, County, and State officials and local media contacts (all information necessary to update this list is assumed to be obtainable over the phone).

We have assumed that EPA will establish the location of the repository and that CH2M HILL will forward copies of the plan to the repository. We have also assumed that CH2M HILL will revise the draft plan based on EPA comments; however, we have assumed that the above format and plan basis will be acceptable.

Quantity Estimate

Labor - Four P4 LOE are included for senior review. 40 P3 LOE are included for preparing the draft plan and 8 LOE are included for finalizing the plan. Finally, 8 P2 LOE are included for support

during plan preparation and 12 T2 LOE are included for drafting.

To accomplish the activities described above, the following number of labor hours were needed for this subtask: 4 P4 hours, 48 P3 hours, 8 P2 hours, and 12 T2 hours.

Deliverables

The following deliverables will be prepared during this subtask: (1) Draft CRP; (2) Final CRP.

(CR.CR.02) - Public Meeting Support

Activity ID: CRCR020 Public Meeting Support
P4: 0 P3: 40 P2: 0 P1: 0 T2: 16 T1: 0 LOE Hours: 56

Technical Approach

CH2M HILL will provide support to EPA for public meetings on an as-requested basis.

Quantity Estimate

Labor - To accomplish the activities described above, the following number of labor hours were needed for this subtask: 40 P3 hours and 16 T2 hours.

Deliverables

No deliverables are included as part of this subtask.

(CR.CR.03) - Fact Sheets Preparation

Activity ID: CRCR030 Fact Sheets Preparation
P4: 0 P3: 40 P2: 0 P1: 0 T2: 16 T1: 0 LOE Hours: 56

Technical Approach

CH2M HILL will provide support to EPA for Fact Sheet preparation on an as-requested basis.

Quantity Estimate

Labor - To accomplish the activities described above, the following number of labor hours have been budgeted for this subtask: 40 P3 hours and 16 T2 hours.

Deliverables

No deliverables are included as part of this subtask.

Task 3 (FI.FI) – Field Investigation

(FI.FI.01) - Identify Field Equipment, Supplies, and Facilities

Activity ID: FIFI010 Identify Field Support Equipment, Supplies, and Facilities
P4: 0 P3: 16 P2: 54 P1: 102 T2: 0 T1: 0 LOE Hours: 172

Technical Approach

This subtask includes the following:

1) Developing technical specifications for the needed field support equipment and services.
2) Identifying suppliers and obtaining competitive bids.
3) Coordinating with them for the delivery of the procured field facilities and services.
4) Coordinating with them our technical requirements for the duration of the field investigation.

The costs of the field support facilities and services for the duration of the field investigation are included under subtask 3.1.2 Mobilization (subtask FI.FI.020). The duration of the field investigation is estimated to be approximately four months including time for mobilization and demobilization. The following field support facilities and services will be procured for the duration of the field investigation: sanitary facility, field trailer, water cooler, trash dumpster and trash removal services,

storage tank for RI-derived wastewater, storage tank for clean water, field computer, phone, fax, printer, ice chest, electrical and phone connection, monthly delivery of water to the tank, monthly electrical charge, monthly phone charge, and a gate for the break in the fence.

This subtask also includes identifying and renting or purchasing the equipment needed for each field event. The following events are estimated to require equipment preparation:

1) LNAPL investigation
2) Soil boring installation and subsurface soil sampling
3) Well installation
4) Surface water and sediment sampling
5) Monitoring well sampling
6) Tidal influence study
7) IDW sampling and disposal (2 events)
8) All other events counted as a single event (surveying, vegetation clearance, utility clearance)

Some events, such as the groundwater sampling, are expected to require significantly more time than others to purchase and rent equipment due to the amount of equipment involved. To the extent possible, the preparation of the field events will be combined to reduce time.

A Property Control Representative (PCR) will be designated on the project. The PCR will be responsible for maintaining the documentation on equipment rental and consumable purchases in conformance with the operating procedures for government property administration established by Far Part 45 and CH2M HILL's approved Government Property System.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Developing technical specifications for 17 field support facilities and services, identifying suppliers, and coordinating with them our technical requirements will require 4 LOE per item or a total of 34 P2 and 34 P1 LOE.

Identifying and arranging for the purchase of the expendables and renting the equipment needed for

the field events is estimated at 5 LOE per event or 20 P2 and 20 P1 LOE.

Maintaining the documentation on equipment purchases in conformance with CH2M HILL's approved Government Property System is estimated at 48 P1 LOE for the project PCR (12 LOE per month of field efforts).

16 P3 LOE for the PM to coordinate these activities is included in the subtask.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 16 P3 hours, 54 P2 hours, and 102 P1 hours.

Deliverables

No deliverables are included for this subtask.

(FI.FI.02) - Mobilization

Activity ID: FIFI020 Mobilization
P4: 0 P3: 26 P2: 120 P1: 144 T2: 0 T1: 0 LOE Hours: 290

Technical Approach

This subtask includes the following:

1) Overseeing at the site the delivery of the field support facilities and services (see subtask 3.1.1 / subtask FIFI010 for the list of needed facilities and services).
2) Setting up the on site field trailer.
3) Assembling, loading, transporting, unloading, and arranging the equipment at the site for each of the identified field events.
4) Installing a gate at the current break in the fence on the east side of the property.
5) Rental costs for the field support facilities and services.
6) Purchase cost for the fence gate.

We have assumed that a swing gate will be installed at the location where the fence is currently broken. The gate will be tied to the existing posts and pillars. It will not be driven into the ground.

The gate will be used to access the area between the fence and the I-280 ramp where a well pair and borings for LNAPL investigation are planned as part of this investigation.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Field days are budgeted at 12 LOE including travel to and from the site.

Coordination of the suppliers and overseeing the delivery of the field facilities and services at the site is estimated to require four days with two people or 48 P2 LOE and 48 P1 LOE.

Setting up the on site field trailer will require two days with one person for a total of 24 P1 LOE.

Assembling, loading, transporting, unloading, and arranging the equipment at the site for each of the field events will require two people for a total of 60 P2 LOE and 60 P1 LOE over the duration of the field investigation.

Installing the gate at the current break in the fence will require one day with two people – 12 P2 and 12 P1 LOE.

To coordinate these activities included in this subtask, 26 P3 LOE is budgeted for the PM.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 26 P3 hours, 120 P2 hours, and 144 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included in Table 1 of Volume II of this Work Plan.

Subcontracts - This subtask includes the rental of the following field facilities and services for the duration of the field investigation for an estimated four months: sanitary facility, field trailer, water cooler, trash dumpster and trash removal services, storage tank for RI-derived wastewater, storage tank for clean water, field computer, phone, fax, printer, ice chest, electrical, and phone connection, monthly delivery of water to the tank, monthly electrical charge, and monthly phone charge. The gate

for the break in the fence will be supplied by a subcontractor. These costs are detailed in Table 4 of Volume II in this Work Plan.

Deliverables

No deliverables are included as part of this subtask.

(FI.FI.03) - Demobilization

Activity ID: FIFI030 Demobilization
P4: 0 P3: 10 P2: 48 P1: 48 T2: 0 T1: 0 LOE Hours: 106

Technical Approach

This subtask includes demobilizing all equipment from the site at the end of the field investigation. All efforts will be made to remove facilities and disconnect services/utilities concurrently. The project files will be removed from the field trailer, brought to the CH2M HILL office in Parsippany, New Jersey, and organized for subsequent project phases.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Demobilization is assumed to require four field days for a team of two – 48 P2 and 48 P1 LOE.

Ten P3 LOE for the PM to coordinate these activities is included in the subtask.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 10 P3 hours, 48 P2 hours, and 48 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included in Table 1 of Volume II of this Work Plan.

Deliverables

No deliverables are included as part of this subtask.

(FI.FI.04) - Perform Site Reconnaissance

Activity ID: FIFI040 Perform Site Reconnaissance
P4: 0 P3: 94 P2: 24 P1: 108 T2: 0 T1: 0 LOE Hours: 226

Technical Approach

This subtask includes

1) Selecting preliminary traverses where vegetation will be cleared to allow execution of the Phase I activities.
2) Selecting preliminary sampling locations.
3) Developing technical statements of work and specifications, identifying prospective bidders, evaluating received proposals, and coordinating with prospective bidders the procurement of the subcontracts for vegetation clearance and surveying services.
4) Oversight of the vegetation clearance and surveying subcontractors in the field.
5) Subcontractor costs for the surveying and vegetation clearance subcontracts.

This subtask will begin with a site visit by the PM, RI Lead, and FTL in order to demarcate the lines where site vegetation will need to be cleared and to select preliminary soil boring and well installation locations. This site visit will occur at the same time as the site visit for wetlands delineation and the site visit by the ecological risk assessor, who will be selecting surface water and sediment sampling locations and collecting other information needed to conduct the ecological risk assessment. This team will work closely to ensure that the objectives of the Phase 1 investigation are met while the impacts of the investigation activities on site wetland areas and any identified habitats are minimized. This will be achieved by selecting vegetation clearance paths and sampling locations, where possible, outside of the limits of wetland areas and identified habitats.

A subcontractor will be procured to clear the vegetation, which will involve a one-time cutting of Phragmites along several lines transecting the site. We have assumed that clearing the vegetation along the following transects will be sufficient to conduct the planned investigation activities: three

east to west transects, six north to south transects, and an area around well MW-3 where floating product is currently present. It is assumed that each transect will be approximately 30 feet wide and that the Phragmites will be removed from the site to control tick exposure during field work. During a second site visit after the vegetation clearance is completed, the PM, RI Lead, and Field Team Lead will finalize the selected sampling locations.

Surveying work will entail two mobilizations. The first mobilization, before the start of the field investigation activities and after vegetation clearance, will include preparing a scaled site plan, surveying the vertical elevations of the five existing on site monitoring wells, surveying the centerlines of the transects where the vegetation was cleared, and surveying the boundary of the demarcated wetland areas. The second mobilization will survey the horizontal coordinates of all new sampling locations and the vertical elevations of the newly installed monitoring wells and piezometers. This information will be plotted on the scaled site plan. If geographical positioning system (GPS) coordinates are available for the sampling points from the 1999 site inspection, these will also be plotted on the scaled site plan. If coordinates are not available, the locations will be estimated in relation to each other and plotted on the scaled site plan.

We have assumed that EPA's Office of Regional Counsel will obtain access agreements from NJDOT, PSE&G, and from the owner of the property where the off site boring will be installed. This subtask includes time to provide support only on an as-requested basis.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Developing technical statements of work and specifications, identifying prospective bidders, evaluating received proposals, and coordinating with prospective bidders the procurement of the subcontracts for vegetation clearance and surveying services will require 20 P3 LOE for each subcontract.

The site visit for selecting traverses for vegetation clearance and preliminary sampling locations will require one field day for the PM, RI Lead, and FTL: 12 P3 LOE, 12 P2 LOE, and 12 P1 LOE.

The second site visit for refining the sampling locations following vegetation clearance will require 1

field day for the RI Lead and FTL: 12 P2 LOE and 12 P1 LOE.

Technical oversight of subcontractor activities is estimated to require:

1) Surveying - two phases, each two days in duration with one team member is estimated at 48 P1 LOE
2) Vegetation clearance - three days in duration with one team member is estimated to require 36 P1 LOE

LOE to provide EPA with support during access agreement negotiations is 24 P3 LOE.

Time for the PM to coordinate these activities includes 18 P3 LOE in the subtask.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 94 P3 hours, 24 P2 hours, and 108 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included Table 1 of Volume II of this Work Plan.

Consumables/Expendables - Consumable and expendable materials must be purchased in order to implement the activities described in this subtask. An estimate of the consumable materials costs is included in Table 2 of Volume II within this Work Plan.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. An estimate of the equipment rental costs is included in Table 3 of Volume II in this Work Plan.

Subcontracts - The following subcontractor costs have been estimated to complete the activities described in this subtask: (1) Vegetation clearance (2) Surveying services. Specific estimates are contained in Table 4 of Volume II of this Work Plan.

Deliverables

This subtask includes the following deliverables: Technical specifications for the surveying and vegetation clearance subcontracts.

(FI.FI.05) - Conduct Geological Investigations

Activity ID: FIFI050 Conduct Geological Investigations
P4: 0 P3: 244 P2: 324 P1: 624 T2: 0 T1: 0 ; LOE Hours: 1192

Technical Approach

This subtask includes the installation and sampling of soil borings and the installation of piezometers and monitoring wells at the site. The scope of the field investigation activities are described in detail in Table D. Tables E and F provide further detail by listing the samples that will be collected at each location and the planned CLP and non-CLP analyses. Figure C located in Appendix B of Volume I shows the proposed soil boring and monitoring well locations.

Specifically, this subtask includes the activities listed below:

1) Technical efforts related to procuring the boring and well installation, non-CLP laboratory analysis, and downhole gamma logging subcontracts.
2) The collection of 10 surface water and 10 sediment samples.
3) The installation and sampling of soil borings and associated monitoring wells and piezometers using the RotaSonic drilling technology and downhole gamma logging of the borings installed for the deep monitoring wells.
4) The collection of LNAPL measurements in installed piezometers and wells while the investigation is ongoing.
5) Sample management including sample bottle labeling and cooler packaging and preparation of associated paperwork including use of FORMS II Lite.
6) Preparation of soil boring logs and entry of lithologic information into the geologic database.
7) Development of task-specific project instructions.
8) Review of the WP, SAP, and HSP by the field sampling team.

One subcontract is anticipated for the boring and well installation program including downhole gamma logging of the borings installed for the deep monitoring wells. This subtask includes the technical efforts related to preparation of technical specifications, participation in a pre-bid meeting at the site with potential subcontractors, evaluation of received bids, negotiations, and subcontract award.

One laboratory subcontract will be procured for all non-CLP analyses. This subtask includes the technical efforts related to preparation of technical specifications, evaluation of received bids, and subcontract award. The non-CLP analyses will include geotechnical testing of soil samples; non-CLP analyses of soil, groundwater, and LNAPL samples; and non-CLP analysis of IDW samples for hazardous waste characterization.

The RotaSonic drilling technology is proposed for use in installing borings and monitoring wells during the Phase 1 investigation activities at the site. It is believed that this technology would provide significant advantages in meeting the technical objectives of the Phase 1 investigation to identify and delineate LNAPL at the site. Attachment H compares in detail the advantages and disadvantages of using this technology versus other available technologies. A brief description of the method and its advantages is provided below.

The RotaSonic method utilizes a rotary core barrel in conjunction with resonating vibrations tuned to optimal frequencies for drilling through the given strata (i.e., the drill stem vibrates and rotates, cutting through the formation). The technique uses a larger diameter core barrel/drill stem (e.g., 6, 10, or 12-inch) to keep the borehole open, and a smaller diameter (e.g., 4-inch) core barrel to retrieve continuous, 10-foot length soil cores in plastic sleeves. If a drilling fluid is required to lubricate or cool the drill bit, potable water is used.

When brought to the surface, the 10-foot long soil cores are cut open, field-screened for VOCs, and the samples for laboratory analyses collected at the selected depth. The volume of soil, which is available using this method, would allow the collection of samples for laboratory analyses as well as samples for the field "shake test" should LNAPL be observed or suspected. In addition, the length and diameter of the core would allow continuous observations for the presence of LNAPL over the entire length of the core – that would be in addition to being able to open the core and observe for LNAPL on the inside, where smearing would not occur. As a result, the depth over which the LNAPL occurs can be better observed. Finally, lithologic information as well as information on whether a sludge layer was left at the bottom of the former lagoon can also be obtained over a continuous length of core.

All soil borings are proposed to be drilled using the RotaSonic drilling technology. A total of 35 shallow soil borings will be installed at the site. These include:

- 12 borings installed for the purpose of investigating the presence of LNAPL and soil

contamination in the area where the LNAPL is suspected at the site; these will be completed as piezometers.

- 13 borings installed for the purpose of investigating soil contamination across the site; these will be abandoned following sampling.
- 6 borings installed for the purpose of investigating soil contamination across the site and for constructing shallow monitoring wells.
- 4 borings installed for the purpose of constructing the four shallow monitoring wells, which will form well pairs with the four deep monitoring wells.

Soil samples will be collected in 31 from the 35 shallow soil borings. Soil samples will not be collected from the four shallow borings installed for the purpose of constructing the shallow monitoring wells in each of the four well pairs. At those locations, the soil samples will be collected from the boring installed for the purpose of constructing the deep monitoring well in the well pair.

A total of four deep borings will be installed for the purpose of constructing the deep monitoring wells that will form well pairs with four of the shallow monitoring wells. Soil samples will be collected from all four of these borings.

Shallow borings will have a maximum terminal depth of 20 feet, targeting the top of the subsurface peat layer at the site. Deep borings will have an estimated terminal depth of 50 feet, targeting the top of the bedrock surface at the site. If the presence of LNAPL is indicated in a soil boring, the boring may be completed as a piezometer at the discretion of the FTL. All borings not completed as piezometers or wells will be abandoned following NJDEP guidelines.

In the absence of any indication as to the presence of contamination based on field observations, this Work Plan specifies the depths at which soil samples will be collected for analyses from all borings.

For the 31 shallow borings, which are planned to extend through the fill materials to the top of the peat layer, three depths are pre-selected for sampling - near the top (0 to 6 inches), near the middle, and at the bottom of each boring.

In the four deep borings, which are planned to extend to below the peat layer, six depths are pre-selected for sampling – near the top (0 to 6 inches), in the middle of the fill materials above the peat, at the bottom of the fill materials and above the peat, approximately 12 to 18 inches below the top of

the peat, at the bottom of the peat, and approximately 12 to 18 inches below the bottom of the peat.

While the drilling/soil retrieval process is ongoing, the entire length of each soil core (10-foot lengths to the terminal depth of the boring) will be screened using a PID and observed for visual indication of LNAPL presence. Based on the relative PID screening levels over the entire core length, a field determination will be made as to the exact interval from which the samples for analysis should be collected. Typically, this would be the interval with the highest PID reading relative to the readings over the rest of the core or the interval where LNPAL presence is observed. In the absence of PID readings or visual indication of LNAPL presence, the samples will be collected at the above pre-determined depths. In addition, field decisions may be made to collect additional samples for laboratory analysis from each boring. Of note, in the four deep borings, the number of samples specified for each lithology (three in the fill materials, two in the peat, and one below the peat) will be maintained even if the PID readings indicate more significant contamination in the fill as compared to the peat. This will ensure that a vertical profile of soil contamination through and below the peat layer is obtained at these locations.

The following options were evaluated for the investigation of the presence of LNAPL at the site:

1. Visual observation of soil cores
2. Visual observation of oil accumulating in piezometers or wells
3. Smear test – smear liquid on white paper; oil stains differently than brown water
4. Submersible shale test (drop soil into water in a jar, agitate, let stand, and observe for NAPL)
5. Submersible test with fluorescent light (drop soil into a lighter fuel as a solvent and expose to sample to UV light)
6. Dye testing and observations
7. Fluorescent light observations
8. Immunoassay kits
9. Optical scanning / Laser Induced Fluorescence

The first four options will be used to determine whether LNAPL is present at the site during the Phase 1 investigation. These tests provide screening-level information at a relatively low-cost. If warranted based on their results, more sophisticated techniques may be applied during subsequent investigation phases at the site.

The twelve piezometers (maximum terminal depth of 20 feet) will be constructed in the same fashion

as the monitoring wells at the site with the following modifications: 1) nominal 2-inch schedule 40 PVC screens and casings will be used; and 2) no outer steel protective casing or concrete pad at the surface will be provided. The piezometers will be installed radially from MW-3, where the presence of LNAPL was observed, and will be used to determine LNAPL thickness. A 20-slot screen with coarse gravel pack will be installed to promote migration of LNAPL into the piezometer.

The 10 shallow wells (maximum terminal depth of 20 feet) and the four deep wells (estimated depth of 50 feet, targeting the top of the bedrock surface at the site) will be constructed using nominal 4-inch schedule 40 PVC casings, with 10-slot (0.01 inch) screen. The shallow wells will be screened across the water table to the top of the peat, enabling determination of LNAPL thickness, if any is noted. We have assumed that the deeper wells will have 10 or 20-foot screens. The length of the screen in each well will be determined in the field based on observations of the geologic cores obtained during the drilling of the well boring. Specifically, if low transitivity materials are observed in the core at the depth at which the deep well screen is planned, the well will be constructed using a 20-foot screen length. If higher transitivity materials are observed at that depth, then a 10-foot screen length will be used. While some indication as to the appropriate screen length will be available at the first deep well location, the screen length at each location will be determined based on the specific lithologic information obtained at that location.

Each well will be constructed following NJDEP guidelines, and will be furnished with a locking cap, outer steel protective casing, and a concrete pad at the surface.

The boreholes installed for the four deep monitoring wells will be logged using a gamma–ray logging tool. This information will be compared to the lithologic observations from the 4-inch diameter, 20-foot long continuous soil cores obtained at each of the deep borings using the RotaSonic drilling technology.

Whenever LNAPL is suspected, the shake test will be performed as a field test to observe for its presence. The test consists of collecting and placing a standardized amount of soil in a water-filled jar. The jar is closed, shaken, and allowed to settle. The thickness of any LNAPL layer is then recorded. The results of this test combined with visual observations of the length of the soil core will allow for observing the relative presence of LNAPL at different depths in a boring and between borings. In addition, following well and piezometer installation, LNAPL thickness measurements will be collected and recorded using an oil/water interface probe.

Of note, stratification groundwater sampling may need to be considered based on field observations and soil screening measurements during the soil boring and well installation program at the site. Specifically, since the groundwater table is at approximately two feet below the ground surface, two of the three soil samples planned in each boring are being collected below the groundwater table. In addition to characterizing contamination in subsurface soils, the saturated soil samples will be used to evaluate the human health risks associated with potential future construction efforts that could put workers in direct contact with these soils.

Stratification sampling may be appropriate at multiple depths if it is desirable to compare contaminant concentrations measured in the soils to the resulting concentrations in the groundwater at a particular location. In addition, if significant LNAPL presence is observed in the soils at a particular depth or significant VOC contamination is indicated at a particular depth during the screening of the soil core (e.g., potential presence of dense non-aqueous phase liquid - DNAPL), it may be appropriate to collect groundwater samples at those depths, also, in order to evaluate the corresponding groundwater conditions. This would be accomplished by placing the intake of the pump at the depth of interest and collecting a groundwater sample at that depth using low flow sampling (the typical groundwater sampling involves placing the pump at the mid-level of the screened interval). CH2M HILL will evaluate the need for stratification sampling and will make a recommendation to EPA on its need after the completion of the soil and well installation program. At this time, we have not budgeted to perform stratification sampling in any of the wells.

During the field investigation, it is estimated that seven coolers packed with samples will be sent for laboratory analysis each day. Each cooler will have its own chain of custody/ trip report. It is assumed that the geological investigation will take place over three consecutive CLP cases. A case report will be generated for each of the three cases.

All sample analyses except those specifically identified in Table F will be performed by EPA's CLP or EPA's Edison laboratory. The non-CLP analyses identified in Table F will be performed by a subcontracted laboratory.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Procurement of the boring and well installation subcontract will include developing the technical statement of work and specifications, identifying prospective bidders, participating in a one-day pre-bid meeting at the site by a senior hydrogeologist and the RI Lead, issuing a bid addendum, evaluating received proposals, responding and coordinating with prospective bidders, and issuing the subcontract: 24 P3 LOE hours, 48 P2 LOE hours, and 48 P1 LOE hours.

Procurement of the laboratory subcontract for all non-CLP analyses will include preparation of technical specifications, evaluation of received bids, and subcontract award. This activity will require an estimate of 24 P3 LOE hours.

A three-person field team is budgeted for the duration of the soil boring and well installation program. Two field team members will be present at the drill rig; one person will be responsible for the health and safety monitoring, driller oversight, and lithologic logging. The second person will be responsible for selecting the sampling depth and collecting the samples. The samples will then be brought to the trailer where the third field team member will perform the shake test in a controlled environment. This team member will also be responsible for labeling and packaging samples and completing all required sample paperwork. They will also be responsible for entering lithologic and well construction information in preparation for generating boring logs and well construction diagrams during the data evaluation task. Maintaining a three-person field team will eliminate driller downtime in order to allow for sample management activities and support the performance and recording of the shake test results.

Installation and sampling of 12 soil borings followed by piezometer installations will require five days by a two-person team. This activity will require an estimate of 120 P1 LOE hours.

Installation and sampling of 10 soil borings followed by shallow monitoring well installations will require six days by a two-person team. This activity will require an estimate of 144 P1 LOE hours.

Installation and sampling of four soil borings followed by deep monitoring well installations will require four days by a two-person team. This activity will require an estimate of 96 P1 LOE hours.

Installation and sampling of 13 soil borings, followed by borehole abandonment will require five days by a two-person team. This activity will require an estimate of 120 P1 LOE hours.

Surface water and sediment sampling will require two days by a two-person team. This activity will

require an estimate of 48 P1 LOE hours.

The third team member will be responsible for sample management and paperwork, performing the shake tests, management of gathered geologic information, and other miscellaneous activities in support of the team performing the sampling. For the total duration of 22 field days, this will require an estimate of 264 P2 LOE hours.

Collecting LNAPL thickness measurements will require one day by a two-person team. This activity will require an estimate of 24 P1 LOE hours.

Review of the WP, SAP, and HSP before beginning field work will require four LOE per plan for each member of the three-person field team or 12 P2 LOE hours and 24 P1 LOE hours.

Preparation of project instructions will require 24 P3 LOE hours.

Senior-level technical support during this subtask will require 24 P3 LOE hours.

The cost for each cooler shipment is estimated at $80 per cooler. Assuming sampling will continue for 20 days and 7 coolers are shipped each day, the total cost of shipment is estimated at $11,200. Time for the PM to coordinate these activities and weekly visits to the site are also included in the subtask for a total of 148 P3 LOE.

The above estimates are based on the following additional assumptions: field activities will be performed in Level D; there will be no delays because of site access, weather, subcontractor equipment problems, unusual geologic conditions, or any other conditions outside of our control. Actual drilling subcontractor costs will be available only after prospective bidders review site conditions.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 244 P3 hours, 324 P2 hours, and 624 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. Estimates of the travel costs are detailed in Table 1 located in Volume II of this WP.

Consumables/Expendables – Consumable and expendables materials must be purchased in order to

implement the activities described in this subtask. Estimate of the consumable materials costs are detailed in Table 2 located in Volume II of this WP.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. Estimates of the equipment rental costs are detailed in Table 3 located in Volume II of this WP.

Subcontracts - The following subcontractors are estimated to be needed to complete the activities described in this subtask: (1) Drilling and well installation subcontract including downhole gamma geophysical logging of four deep boreholes; (2) Non-CLP laboratory analysis subcontract for soil and LNAPL samples (Note: one subcontract for all non-CLP analyses will be procured; subcontract costs for the non-CLP analyses of the groundwater samples and IDW samples are budgeted under the corresponding subtasks). These subcontract cost are detailed in Table 4 located in Volume II of this WP.

Other Direct Costs – A detailed estimate of the Other Direct Costs are contained in Table 6 located in Volume II of this WP.

Deliverables

The following deliverables will be prepared during this subtask: (1) Technical specifications for the drilling and laboratory subcontracts; (2) Sample paperwork.

(FI.FI.06) - Conduct Hydrogeological Investigation

Activity ID: FIFI060 Conduct Hydrogeological Investigations
P4: 0 P3: 78 P2: 0 P1: 384 T2: 0 T1: 0 LOE Hours: 462

Technical Approach

The scope of the hydrogeologic investigation activities are described in detail in Table D. Tables E and F provide further detail by listing the samples that will be collected at each location and the planned CLP and non-CLP analyses. Figure C found in Volume I, Appendix B, shows the proposed monitoring well locations.

This subtask includes the following activities:

1) Develop five existing, 14 newly installed wells, and 12 piezometers. This will be performed using a combination of surge blocking and pumping of the wells.
2) Collect groundwater samples from all 19 monitoring wells using the low-flow sampling technique.
3) Perform a tidal investigation to determine any tidal influences on site hydrogeology. This will involve the installation of pressure transducers with dataloggers for a one-week period in the shallow and deep well in each of the four well pairs at the site. After one week, the transducers will be removed from the wells and the information will be downloaded.
4) Collect two complete rounds of water levels and LNAPL thickness measurements. One round will be collected at the start of the tidal study. The second round will be collected at the start of the groundwater sampling event.
5) Perform associated sample management and paperwork preparation.
6) Review the portions of the WP and SAP related to the groundwater sampling event.
7) Prepare task-specific project instructions.

The activities under this subtask are planned in the following sequence: develop the wells, collect one round of water levels and LNAPL thickness measurements, install eight dataloggers, monitor water levels for one week, remove dataloggers, download data from loggers, collect one round of water levels and LNAPL thickness measurements, collect groundwater samples, analyze downloaded data from loggers, complete all associated paperwork.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

This subtask has been budgeted for a two-person field team.

Development of new and existing monitoring wells and piezometers will require five days by a two-person team. This activity will require an estimate of 120 P1 LOE hours.

Groundwater sampling will require five days by a two-person team. This activity will require an estimate of 120 P1 LOE hours.

The tidal investigation will require one day by a two-person team to set up the dataloggers (24 P1 LOE hours), and one day by a two-person team to remove the dataloggers (24 P1 LOE hours). Processing and evaluating the information from the eight dataloggers will require 3 P1 LOE hours per logger for a total of 24 P1 LOE hours.

Each round of water level and LNAPL thickness measurements will require one day by a two-person team or 24 P1 LOE hours. Two rounds will be performed for a total of 48 P1 LOE hours. Sample management and associated paperwork will require an estimate of 16 P1 LOE hours.

Review of the WP and SAP will require an estimate of 4 P1 LOE hours for each field team member or a total of 8 P1 LOE hours.

Preparation of project instructions will require an estimate of 12 P3 LOE hours.

Senior level technical support during this subtask will require an estimate of 8 P3 LOE hours.

Time for the PM is estimated at 58 P3 LOE to coordinate these activities and one visit to the site is also included in the subtask.

The cost for each cooler shipment is estimated at $80 per cooler. One cooler per well is assumed for a total cost of shipment of $1,520.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 78 P3 hours, and 384 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included in Table 1 of Volume II of this Work Plan.

Consumables/Expendables – Consumable and expendable materials must be purchased in order to implement the activities described in this subtask. Estimates of the consumable materials costs are detailed in Table 2 located in Volume II of this WP.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. Estimates of the equipment rental costs are detailed in Table 3 located in Volume II of this WP.

Subcontracts - The following subcontracts are estimated to be needed to complete the activities described in this subtask: Non-CLP laboratory analysis subcontract for groundwater samples. Estimates of the subcontract costs are detailed in Table 4 located in Volume II of this WP.

Other Direct Costs - A detailed estimate of the Other Direct Costs are in Table 6 located in Volume II of this WP.

Deliverables

The following deliverable will be prepared during this subtask: Sample paperwork.

(FI.FI.07) - Conduct Waste Investigation

Activity ID: FIFI070 Conduct Waste Investigation
P4: 2 P3: 12 P2: 4 P1: 0 T2: 0 T1: 0 LOE Hours: 18

Technical Approach

This subtask includes time to review information gathered during the Phase 1 remedial investigation in order to evaluate various approaches for investigating the former landfill during Phase 2.

Quantity Estimate

Labor - The labor hours estimated to be needed under this subtask are for review of the Phase 1 information and discussions on various approaches to investigating the former landfill. It is assumed that this will require 4 P3 LOE for the PM, 8 P3 LOE for a landfill specialist, and 4 P2 LOE for the RI Lead. Senior technical support will require 2 P4 LOE.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 2 P4 hours, 12 P3 hours, 4 P2 hours.

(FI.FI.08) - Conduct Utility Clearance

Activity ID: FIFI080 Conduct Utility Clearance

P4: 0 P3: 20 P2: 0 P1: 24 T2: 0 T1: 0 LOE Hours: 44

Technical Approach

This subtask includes the following:

1) Procurement of the utility clearance subcontract including developing the technical statement of work and specifications, identifying prospective bidders, evaluating received proposals, coordinating with prospective bidders, and issuing the subcontract.

2) Performing the utility clearance in a single mobilization in order to clear proposed boring locations for underground utilities and the occurrence of small grouping of buried drums.

All proposed boring locations will be cleared with the exception of the locations where piezometers will be installed surrounding well MW-3. This area will not undergo clearance because the area is located within the limits of the former lagoon, which was back filled. As such, no utilities or drums are expected in this area. In addition to the clearance of each location, the New Jersey One Call System will also be used to identify utility lines entering the property.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Procurement of the utility clearance subcontract will include preparation of technical specifications, evaluation of received bids, and subcontract award, and will require an estimate of 16 P3 LOE hours.

Oversight of the utility clearance subcontractor will require two days by one person for a estimate of 24 P1 LOE hours.

The PM will require 4 P3 LOE hours to coordinate these activities.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 20 P3 LOE hours, 24 P1 LOE hours.

Travel -Travel to the site is included to implement the activities described in this subtask. A breakdown of the travel costs is detailed in Table 1 located in Volume II of this WP.

Consumables/Expendables - Consumable and expendable materials must be purchased in order to implement the activities described in this subtask. Estimate of the consumable materials costs are detailed on Table 2 located in Volume II of this WP.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. Estimates of the equipment rental costs are detailed on Table 3 located in Volume II of this WP.

Subcontracts - The following subcontractor is estimated to be needed to complete the activities described in this subtask: Utility clearance subcontractor. Estimates of subcontract costs are detailed in Table 6 located in Volume II of this WP.

Deliverables

The following deliverable will be prepared during this subtask: Technical specifications for the utility clearance subcontract.

(FI.FI.09) - Conduct Ecological Investigation

Activity ID: FIFI090 Conduct Ecological Investigation
P4: 2 P3: 90 P2: 0 P1: 60 T2: 0 T1: 0 LOE Hours: 152

Technical Approach

This subtask includes the following:

1) Review of secondary sources of information on the area where the site is located.
2) Site visit to delineate on site wetland areas.
3) Preparation of a technical memorandum detailing the wetlands delineation results.

CH2M HILL will collect and review the following secondary source data in preparation of the wetland delineation activities:

1) Hudson County Survey
2) NJDEP Freshwater Wetland QuarterQuad Maps
3) United States Geological Survey Quadrangles
4) The results of the previous wetland delineation

In addition, CH2M HILL will contact the following agencies to determine the potential occurrence of habitats for federal and State threatened and endangered species at the site:

1) United States Fish and Wildlife Service
2) National Marine Fisheries Service
3) New Jersey Natural Heritage Program

CH2M HILL has determined that the Diamond Head project site is located within the limits of the New Jersey Meadowlands Commission and falls under the wetland jurisdiction of the US Army Corps of Engineers (USACE). Therefore, we will delineate wetlands and waterbodies within the limits of the 15-acre site in accordance with the USACE *1987 Manual for Delineating Wetlands*. The map depicting the results of the wetland delineation will identify the wetland types based on the Cowardin classification system (Cowardin et al., 1979).

The wetlands delineation site visit is planned for the same time as the selection of vegetation clearance paths, soil borings and well locations, and surface water and sediment sampling locations. This team will work closely to ensure that the objectives of the Phase 1 investigation are met while the impacts of the investigation activities on site wetland areas are minimized. This will be achieved by selecting vegetation clearance paths and sampling locations, where possible, outside of the limits of the on site wetlands areas. We plan to review the entire 15-acre site for the presence of wetlands.

The wetland delineation will involve placing sequentially numbered flags along the jurisdictional boundaries of each wetland and waterbody. The flagging will be left on site so that field teams can orient themselves easily during field activities. A minimum of four soil points will be documented for vegetation, hydrology, and soils and flagged accordingly (e.g. SP-1, SP-2) The location of all wetland flags and soil points will be surveyed as part of the Perform Site Reconnaissance subtask. Under this subtask, a site plan showing the delineated wetland areas will be prepared and present the

wetland boundaries and areas of wetland impacts. Photographic documentation and field survey sheets will be completed for each wetland and waterbody within the site. In addition, USACE data sheets will be completed for the study area.

Data will be compiled into a TM that will describe the following:

1) Existing conditions
2) Methodology
3) *Field observations (vegetation, soils, hydrology)*
4) Wetland descriptions
4) Federal and State threatened and endangered species and their habitats
5) Wetland delineation site plan
6) Proposed wetland impacts

This TM will be provided to EPA at the end of the Phase 1 remedial investigation activities.

CH2M HILL assumes that EPA will review the wetland delineation and proposed impacts in accordance with Nationwide Permit #38 – Clean up of Hazardous and Toxic Wastes, Modified January 15, 2002 and coordinate all jurisdictional activities with the USACE, NJDEP, and NJ Meadowlands Commission pursuant to CERCLA 121 (e) exemption from the requirement to obtain state and local permits.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Review of the information in preparation for the site visit will require 8 P3 LOE hours.

Obtaining and reviewing information from federal agencies related to the wetland delineation will require 16 P3 LOE hours.

The site visit for wetland delineation will require three days by a two-person team with the first day spent on guiding the selection of sampling locations and vegetation clearance paths. An estimated 36 P3 LOE hours and 36 P1 LOE hours are budgeted.

Preparation of the technical memorandum will require 8 P3 LOE hours and 24 P1 LOE hours.

Coordinating with the surveying subcontractor to ensure that the limits of the wetland areas and the areas of potential impacts are accurately depicted will require 8 P3 LOE hours.

Senior technical support for the technical memorandum will require 2 P4 LOE hours.

The Project Manager will require 14 P3 LOE hours to coordinate these activities.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 2 P4 hours, 90 P3 hours, and 60 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. An estimate of the travel costs is included in Table 1 of Volume II of this Work Plan.

Consumables/Expendables – Consumable and expendable materials must be purchased in order to implement the activities described in this subtask. Estimate of the consumable materials costs are detailed on Table 2 located in Volume II of this WP. Personal protective equipment is assumed to come from the pool purchased under the site reconnaissance subtask.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. However, because the site visit under this subtask is planned at the same time as the site visits for site reconnaissance and wetland delineation, it is assumed that equipment can be shared between the three and the equipment costs are included under the site reconnaissance subtask. Estimates of the equipment rental costs are detailed in Table 3 located in Volume II of this WP.

Deliverables

The following deliverable will be prepared during this subtask: TM describing the wetland delineation activities and results.

The deliverable will be incorporated into the TM to be prepared at the completion of the Phase 1 activities.

(FI.FI.10) - Dispose Investigation-Derived Waste

Activity ID: FIFI100 Dispose of Investigation-Derived Waste
P4: 0 P3: 12 P2: 60 P1: 60 T2: 0 T1: 0 LOE Hours: 132

Technical Approach

This subtask includes the following activities related to management of IDW:

1) Technical efforts related to procuring the IDW disposal subcontract including developing the technical statement of work and specifications, identifying prospective bidders, evaluating received proposals, responding and coordinating with prospective bidders, and issuing the subcontract.
2) Sampling of drums with soil cuttings and decontamination liquids to determine their waste characteristics.
3) Obtaining EPA's approval of the facilities proposed by the selected subcontractor for IDW disposal.
4) Determining IDW characteristics and preparing waste profiles and manifests.
5) Oversight of the pumping and clean-out of the IDW storage tank prior to its removal from the site.
6) Oversight of the removal of the drums with IDW from the site.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Technical efforts related to procurement of the IDW disposal subcontract will require 40 P2 LOE. Sampling of drums will require one day by a two-person team or a total of 24 P1 LOE.

Review of the testing results, recommending an appropriate waste classification to EPA, obtaining EPA's approval of the facilities proposed for IDW disposal by the selected subcontractor, and preparation and tracking of paperwork will require 20 P2 LOE.

Oversight of the pumping and cleaning of the IDW storage tank will require two days or 24 P1 LOE.

Oversight of the removal of the drums with IDW will require one day or 12 P1 LOE.

This estimate assumes that a total of 21,000 gallons of water and 150 drums will be generated from the Phase 1 investigation. The water is assumed to be transported and disposed at the DuPont Deepwater, New Jersey facility and the drums with IDW are assumed to require disposal as hazardous waste.

Time for the PM is estimated at 12 P3 LOE to coordinate these activities.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 12 P3 hours, 60 P2 hours, and 60 P1 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. Estimates of the travel costs are detailed in Table 1 located in Volume II of this WP.

Subcontracts - The following subcontractors are estimated to be needed to complete the activities described in this subtask: (1) Disposal subcontractor; (2) Non-CLP laboratory analyses of IDW samples. Estimates of the subcontract costs are detailed in Table 4 located in Volume II of this WP.

Deliverables

The following deliverables will be prepared during this subtask: Waste profiles and manifests documenting appropriate disposal of the wastes.

Task 5 (AN.AN) – Analytical Support and Data Validation

(AN.AN.01) - Sample Management

Activity ID: ANAN010 Sample Management

P4: 0 P3: 34 P2: 123 P1: 44 T2: 0 T1: 0 LOE Hours: 201

Technical Approach

Daily management of samples including weekly sampling forecasts, sample packaging and labeling, cooler packaging and labeling, and preparation of *chain of custody* (COC) forms will be accomplished by the field team during their routine daily on site activities. This subtask includes the following sample management activities:

1) Provide EPA's Sample Management Office with forecasts of the expected number of samples and analyses at the start of the soil investigation and again at the start of the groundwater sampling. Additional forecasts to obtain undivided cases are included under Task 3.
2) Prepare an estimated number of four case reports.
3) Review the hard copies of the validated data packages and resolve outstanding issues related to qualifiers (for example, often the validated reports do not indicate which of two duplicate / re-extracted analyses performed by the laboratory on the same sample should be used for reporting; this requires review of the laboratory data package by a chemist in order to resolve).
4) Review the hard copies of the validated data packages for each case versus the electronic files and correct inconsistencies in the results.
5) Establish and maintain a sample tracking system. This system will also be used to import field information into the project database.
6) Coordinate with EPA regarding analytical, data validation, and quality assurance issues.
7) Provide COC, sample retention, and data storage functions.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

Provide EPA with forecasts of the expected number of samples and analyses at the start of the soil investigation and at the start of the groundwater sampling – 8 P1 LOE hours and 2 P2 LOE hours for the soil sampling and 4 P1 LOE hours and 1 P2 LOE hour for the groundwater sampling.

Prepare an estimated number of four case reports for a total of 8 P1 LOE hours and 2 P2 LOE hours per case.

Review the hard copies of the validated data packages and resolve outstanding issues related to

qualifiers is estimated to require6 P2 LOE hours and 1 P3 LOE hour per case.

Review the hard copies of the validated data package for each case versus the electronic files and correct inconsistencies in the results is estimated to require6 P2 LOE hours and 1 P3 LOE hour per case.

Establish and maintain a sample tracking system is estimated to require8 P3 LOE hours to establish and 8 P2 LOE hours per case to input the information.

Coordinate with EPA regarding analytical, data validation, and quality assurance issues – 4 P2 LOE hours per case following completion of the field activities.

Provide COC and sample hard copy and electronic file data organization and retention functions – 4 P2 LOE hours per case.

18 P3 LOE is also included for the PM to coordinate the technical execution of these activities. Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 34 P3 hours, 123 P2 hours, and 44 P1 hours.

Deliverables

The following deliverables will be prepared during this subtask: (1) forecasts of the total number of samples to be collected at the onset of the soil and groundwater sampling activities; (2) case reports; (3) sample tracking spreadsheet listing collected samples along with field information; (4) complete and accurate set of data for import into the project database.

The sample tracking sheet will also be incorporated into the technical memorandum to be prepared at the completion of the Phase 1 activities.

(AN.AN.02) - Data Validation

Activity ID: ANAN020 Data Validation
P4: 2 P3: 3 P2: 30 P1: 0 T2: 0 T1: 0 LOE Hours: 35

Technical Approach

For analyses performed outside of the CLP during the Phase 1 investigation, CH2M HILL will perform a data review based on an evaluation of method-specific quality control data and the best professional judgment. These data will be used in the engineering evaluation of alternatives but not in assessing the human health and ecological risks. This subtask includes the review of the results of non-CLP analyses of samples to assess their usability. A forms review will be used for this purpose with the following forms reviewed (as applicable to the analyses):

1) Holding times and sample temperature upon receipt by the laboratory
2) Surrogate recovery
3) Matrix Spike/Matrix Spike Duplicate (MS/MSD) precision and accuracy
4) Laboratory control sample precision and accuracy
5) Initial calibration and continuing calibration precision and accuracy
6) Instrument tuning criteria
7) Blank contamination
8) Field duplicate precision and accuracy

After the completion of the forms review, a TM summarizing the data review process and its conclusions will be prepared.

It is assumed that validated results will be available for all samples analyzed through CLP.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below:

The forms review will cover the analyses and number of samples listed in Table F of this WP and is estimated to require 22 P2 LOE hours.

Preparation of a TM is estimated to require 8 P2 LOE hours.

Senior technical support is estimated at 2 P4 LOE hours for the TM.

The PM will require 3 P3 LOE hours to coordinate this effort with the technical staff performing the review.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 2 P4 LOE hours, 3 P3 LOE hours and 30 P2 LOE hours.

Deliverables

The following deliverable will be prepared during this subtask: TM summarizing the data review process and its conclusions.

The deliverable will be incorporated into the TM to be prepared at the completion of the Phase 1 activities.

Task 6 (DE.DE) - Data Evaluation

(DE.DE.01) - Data Usability Evaluation

Activity ID: DEDE010 Data Usability Evaluation
P4: 4 P3: 8 P2: 80 P1: 0 T2: 0 T1: 0 LOE Hours: 92

Technical Approach

All organics and inorganics data analyzed through the CLP undergo systematic data validation prior to their release to contractors in order to provide assurance that the data are adequate for their intended use. The data are validated in accordance with the EPA Organic/Inorganic National Functional Guidelines and/or EPA Region 2 Data Validation Standard Operating Procedures. EPA Region 2 Hazardous Waste Support Section personnel in conjunction with the EPA Division of Environmental Science and Assessment (DESA) personnel perform the data validation. DESA Laboratory Branch data (if used) are validated by the DESA Laboratory Branch.

This subtask includes a review and evaluation of the validated results of CLP analyses from the 1991 and 1999 investigations and from this Phase 1 investigation in order to evaluate the usability of the data and establish any limitations on their use in drawing conclusions about the extent of

contamination at the Diamond Head site. A TM describing the results of each evaluation will be prepared.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below:

Perform the data quality evaluation (DQE) and prepare a TM on the 1991 and 1999 data will require 40 P2 LOE hours.

Perform the DQE and prepare a TM on the data collected as part of the Phase 1 investigation is estimated at 40 P2 LOE hours

Technical support is estimated at 2 P2 LOE for each TM.

The PM will require an estimate of 8 P3 LOE hours to coordinate this effort with the technical staff performing the review.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 4 P4 hours, 8 P3 hours, and 80 P2 hours.

Deliverables

The following deliverables will be prepared during this subtask: (1) TM detailing the results of the data quality evaluation of the 1991 and 1999 results; (2) TM detailing the results of the data quality evaluation of the results from the Phase 1 investigation

The deliverables will be incorporated into the TM to be prepared at the completion of the Phase 1 activities.

(DE.DE.02) - Data Reduction, Tabulation & Evaluation

Activity ID: DEDE020 Data Reduction, Tabulation, and Evaluation
P4: 0 P3: 204 P2: 473 P1: 198 T2: 0 T1: 0 LOE Hours: 875

Technical Approach

This subtask includes the management and technical evaluation of the analytical data collected at the site during the 1991 and 1999 site inspections as well as analytical and geological data collected during this Phase 1 RI. For the purposes of this SOW, data management includes data reduction, tabulation, and plotting.

All 1991 and 1999 samples were analyzed through CLP; however, the analytical results are not available electronically and will, therefore, require manual data entry into the project database management system. We have assumed that the results for all samples analyzed through CLP as part of this remedial investigation will be provided as Lotus-based electronic files, which can be imported directly into EquIS, the database management system that will be used for this project by using the EPA Region II electronic data checker.

The project data will be managed using the EquIS database; boring logs and fence diagrams will be generated using Log Plot; and geologic cross sections and well construction diagrams will be generated using Rockworks. Using a database will allow for data from any future investigations and long-term monitoring at the site to be combined and / or compared with the 1991/1999/2002 results and used to support long-term decision-making at the site. This task is also based on using the data management process already established for the other EPA Region 2 assignments managed by CH2M HILL.

The existing data will be manually entered into the database (the 1991 and 1999 data) and the Phase 1 data will be imported directly into EquIS from the electronic data files. We have assumed that the data from the Phase 1 investigation will be imported in two events – one for all the soil, surface water, and sediment data and one for all the groundwater data. The 1991 and 1999 data include approximately 110 samples, including QA/QC samples. Since each sample was analyzed for VOCs, SVOCs, pesticides, PCBs, and metals, a total of approximately 17,000 records are estimated to require manual data entry. The Phase 1 data are estimated to consist of approximately 187 samples, including QA/QC samples. This corresponds to approximately 33,000 records, which will require

import into the database.

This subtask will be performed in two phases. The first phase will involve gathering, entering, tabulating, and plotting the existing 1991 and 1999 data. This will allow for the existing data to be used in decision-making early in the remedial investigation process. The first phase will also include the preparation of a sample tracking sheet where all 1991/1999 sample information will be summarized and imported into the project database.

During the second phase, the 1991 and 1999 data set will be combined with the data from this Phase 1 investigation and the combined data set tabulated and plotted for presentation in the Phase 1 TM. The tables and plots to be generated during each phase are described under deliverables below. This subtask also includes technical evaluation of the results of the data management efforts.

Quantity Estimate

Labor - The labor hours estimated to be needed to prepare the tables and figures described in this subtask using the established project database and evaluate their results are based on the assumptions described below:
Preparation of the sample tracking sheet for the 1991 and 1999 data will require 8 P3 LOE to set-up, 8 P1 LOE to complete for the 1991 data and 20 P1 LOE to complete for the 1999 data.

Importing the electronic files for the Phase 1 data into the project database is estimated at approximately .75 LOE per sample or a total of 100 P2 and 40 P3 LOE.

Hand keying the data from the 1991 and 1999 sampling events is estimated at approximately 2.25 LOE per sample or a total of 200 P1 and 53 P2 LOE.

Preparing tables from the database is estimated at 4 LOE per table for 40 tables or a total of 140 P2 and 20 P3 LOE.

Preparing GIS plots of the data is estimated at 5 P3 LOE per plot for 20 plots or a total of 100 P3 LOE.

Generating the boring logs and well construction diagrams from the project database is estimated at 3 LOE per log for 56 logs or a total of 140 P2 and 28 P3 LOE.

Preparing the cross sections / fence diagrams from the project database is estimated at 12 LOE per cross section / fence diagrams for 4 plots or a total of 40 P2 and 8 P3 LOE.

Note that all LOE are averages over the scope for this task.
Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 204 P3 hours, 533 P2 hours, and 228 P1 hours.

Deliverables

The following deliverables will be prepared during this subtask and submitted to EPA in the technical memorandum to be prepared at the completion of the Phase 1 remedial investigation activities:

Existing data

1) Tables for soil and sediment showing detected concentrations only. The following information will be included for each location: station, sample depth, CH2M HILL sample number, CLP sample number, date sampled, analyte, concentration, units.
2) Plots showing both the sediment and soil sampling results – one plot will show total detected organics for each class of contaminants (VOCs, SVOCs, pesticides, and PCBs) and the second plot will show selected metals.

Existing and New Data

1) Tables containing a printout of the entire database will be generated, with separate printouts for the four media that will be sampled (soil, groundwater, surface water, and sediment). The following information will be included for each location: station, sample depth, CH2M HILL sample number, CLP sample number, and date sampled. Separate tables will be provided for each class of compounds (VOCs, SVOCs, pesticides, PCBs, and metals) in each of the sampled media. Note that tables for a medium will have the same list of sample stations (i.e., same list of borings will appear on all tables).
2) Tables for each medium sampled showing only detected concentrations and highlighting the concentrations exceeding standards/criteria. Separate tables will be provided for each class of compounds (VOCs, SVOCs, pesticides, PCBs, and metals) in each of the four sampled media. Total detected concentrations will also be calculated for organics at each location (VOCs, SVOCs, pesticides, PCBs). Note that tables for a medium will have the same list of sample stations (i.e., same list of borings) and the same sample information for each location as the tables above.

3) Plots showing spider diagrams of the contaminant concentrations in soil, groundwater, surface water, and sediment that exceed standards/criteria (i.e., a call out box for each location showing the concentrations detected above the standards/criteria at each depth at each location). If a significant number of compounds are detected above standards/criteria, only selected compounds will be plotted. The following plots will be considered for preparation, if appropriate, based on the analytical results: VOCs, SVOCs, PCBs, and metals in soil; VOCs, SVOCs, PCBs, and metals in groundwater; VOCs, SVOCs, PCBs, and metals in surface water and sediment.

4) Plots showing isoconcentration contour maps of total concentrations. The following plots will be considered for preparation, if appropriate, based on the analytical results: SVOCs, PCBs, and selected metals in soil above the peat; SVOCs and selected metals in groundwater above the peat.

5) LNAPL thickness contour map.

6) Two groundwater elevation contour maps - one above the peat and one below the peat.

7) Two geologic cross sections of the site and two fence diagrams. In order to minimize revisions of these deliverables, we plan to select the borings through which the two cross-section lines will pass, hand-mark the lines on a site plan, and provide our proposal to EPA for review and approval. We will discuss the basis for our proposal with EPA and modify the locations of the lines and the borings through which they pass, as agreed upon during this discussion before we begin work on the draft deliverables. This approach is expected to minimize the amount of revisions and associated LOE that may be needed to address comments after preparation of the draft deliverables. We will also address any additional EPA comments and requests after the draft deliverables are completed and will inform EPA of the associated LOE.

8) Boring logs for 37 borings and well construction diagrams for 19 wells.

(DE.DE.04) – Technical Memorandum (Data Evaluation)

Activity ID: DEDE040 Technical Memorandum (Data Evaluation Report)
P4: 24 P3: 204 P2: 224 P1: 200 T2: 0 T1: 0 LOE Hours: 652

Technical Approach

A TM will be prepared at the end of the Phase 1 investigation. The memorandum will contain the results of the following:

- Summary of the performed Phase 1 activities

- Summary of the Phase 1 results
- Recommendations for the Phase 2 investigation
- Usability evaluation of the collected data
- Wetland delineation
- Phase 1 ERA results
- Phase 1 HRA results
- Tables and figures presenting the geological and chemical contamination information
- A description of the conceptual site model on which the recommendations for the Phase 2 investigation will be based including a description of the regional and site-specific geology and hydrogeology, the nature and extent of contamination, comparison of detected concentrations to Preliminary Remediation Goals (PRGs) and other criteria identified as potentially applicable to the site, and discussion of potential sources and migration pathways identified at the site.

The Phase I memorandum will also combine the results of the previous site inspections with the Phase 1 investigation results.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below:

The Draft TM will require 24 P4 hours, 120 P3 LOE hours, 120 P2 LOE hours, and 80 P1 LOE hours.

Preparation of the conceptual site model will require 60 P3 hours, 80 P2 hours, and 120 P1 hours.

Addressing EPA's comments and producing a Final TM will require 24 P3 LOE hours and 24 P2 LOE hours.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 24 P4 LOE hours, 204 P3 LOE hours, 224 P2 LOE hours, and 200 P1 LOE hours.

Deliverables

The following deliverables will be prepared during this subtask: (1) Draft Phase 1 TM, (2) Final Phase 1 TM

Task 7 (RA.RA) - Assessment of Risk

(RA.RA.01) - Draft Human Health Risk Assessment

Activity ID: RARA010 Draft Human Health Risk Assessment Report
P4: 6 P3: 6 P2: 54 P1: 0 T2: 0 T1: 0 LOE Hours: 66

Technical Approach

This subtask includes the preparation of a quantitative Human Health Risk Assessment (HHRA). Table G identifies the exposure pathways that will be evaluated as part of this risk assessment. The risk assessment approach that will be followed and the associated assumptions are described below:

1) There is no current use of the site. Although unlikely, trespassers could currently access the site and contact the surface soil.
2) Future use of site will most likely be industrial/commercial. The site is unlikely to be developed for residential use. However, as a hypothetical future scenario, residential use of the site will be evaluated. The future scenario and exposure pathways will be based on information obtained by EPA from the property owner on the planned future uses of the site.
3) The conservative assumption will also be made that although unlikely, groundwater beneath the site would be used in the future as a source of potable supply. Before developing the groundwater use scenario, the New Jersey groundwater classification for the site will be reviewed and used to determine the appropriate scenario assumptions.
4) Vapor intrusion from groundwater and soil into a future building, and subsequent inhalation by workers or residents will be evaluated using the Johnson and Ettinger model.
5) Constituents of Potential Concern (COPCs) for the site will be selected by comparison to EPA Region 9 PRGs. The most recent Region IX PRGs will be used to select the COPCs. Before beginning COPC selection, the toxicity numbers used to calculate the Region IX PRGs will be verified using EPA's IRIS to ensure that they reflect the most current values and have not changed since the time of the most recent PRG update (currently, these are the October 2002

PRG values). If the toxicity numbers have been updated, the PRGs will need to be re-calculated using these updated numbers. For the purpose of estimating LOE, however, we have assumed that there will be no changes to the toxicity values that would require re-calculating the PRG values.

6) Leaching of contaminants from soil (from all depths) to groundwater will be evaluated by comparison to EPA Region 9 soil-to-groundwater Soil Screening Levels (SSLs) based on a dilution and attenuation factor of 20. A dilution and attenuation factor of 20 was selected because there are no water supply wells on site or in close proximity to the site, thus allowing for a higher degree of dilution before contaminants reach receptors.
7) The 95 percent upper confidence limit of the mean (95%UCL) will be calculated for the surface soil and the subsurface soil using all the available data. The 95%UCL will be used as the exposure point concentration (EPC), unless it is greater than the maximum concentration, in which case the maximum concentration will be used as the EPC.
8) Data from all the wells sampled will be used to calculate the groundwater EPC.
9) Fugitive and volatile emissions from soil will be estimated using the methodology presented in the USEPA *Soil Screening Guidance* Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/R-96/018, April 1996.
10) Exposure to VOCs in groundwater while showering will be estimated using the Schaum Method.
11) Preliminary remediation goals will be calculated for those constituents identified as COPCs (constituents with individual carcinogenic risks greater than 10^{-5} when the total risk to the receptor is greater than 10^{-4} and/or the noncarcinogenic hazard greater than 0.1 when the total noncarcinogenic hazard to the receptor is greater than 1).

The remedial investigation at the Diamond Head site will be performed using a phased RI approach with an LNAPL delineation, soil sampling, and groundwater sampling performed during the Phase 1 investigation. Based on the Phase 1 results, additional sampling may be performed during Phase 2. Because the risk assessment will be based on both the Phase 1 and Phase 2 results as well as historical validated data, the complete quantitative risk evaluation will not be performed until after the Phase 2 investigation is completed. However, a screening level HHRA will be performed after the Phase 1 RI is completed. This assessment will involve screening the data collected during the Phase 1 investigation and historical validated data against appropriate human health risk-based screening criteria in order to determine the COPCs to human health.

Statistical analysis of the data used to calculate the exposure point concentrations will be performed using Pro-UCL software.

This WP includes the costs for preparing this screening level HHRA. Based on its results, the HHRA approach will be re-evaluated and costs for the complete quantitative HHRA will be provided as part of a WPRR.

The activities and deliverables that will be part of each risk assessment phase are identified below:

End of Phase 1

1) Based on the Phase 1 data, prepare RAGS Part D standard tables 1 and 2 (the selection of exposure pathways and selection of COPCs). Tables will be submitted as part of the Phase 1 TM.
2) The data collected during Phase 1 and validated historical data will be used to complete screening assessment.

End of Phase 2

1) Based on the Phase 1 data, Phase 2 data, and validated historical data, prepare RAGS Part D standard tables 1 through 6 and the Pathway Analysis Report.
2) After EPA's review and comment of these tables, prepare complete quantitative HHRA, including RAGS Part D standard tables 7 through 10.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below:

The preparation of the RAGS Part D standard table 1 will require 4 P2 LOE hours.

The preparation of the RAGS Part D standard table 2 for the surface soil, the groundwater, and the subsurface soil will require 6 P2 LOE hours.

The review and evaluation of the historical data and Phase 1 data, including selecting the applicable data from the database, will require 16 P2 LOE hours.

Statistical calculations will require 4 P2 LOE hours.

The preparation of the summary of the results of the Phase 1 human health screening, to be included in the Phase 1 TM, will require 24 P2 LOE hours.

Senior technical support for the standard tables and accompanying text will require 6 P4 LOE hours. The PM will require 6 P3 LOE hours to coordinate these activities.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 6 P4 LOE hours, 6 P3 LOE hours, and 54 P2 LOE hours.

Deliverables

The following deliverables will be prepared during Phase 1 under this subtask: (1) RAGS Part D standard tables 1 and 2; (2) A summary of the results of the performed risk screening in RAGS Part D standard table 2.

These deliverables will be incorporated into the TM to be prepared at the completion of the Phase 1 activities.

(RA.RA.02) - Draft Ecological Risk Assessment

Activity ID: RARA020 Draft Ecological Risk Assessment Report
P4: 6 P3: 192 P2: 97 P1: 0 T2: 0 T1: 0 LOE Hours: 295

Technical Approach

This subtask includes the preparation of an Ecological Risk Assessment (ERA) following the eight step process presented in the *USEPA Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, 1997; Interim Final; EPA 540/R/97/006; OSWER 9825.7-25; June 1997.*

The RI at the Diamond Head site will be performed in two phases. The eight steps of the ERA process will be conducted such that the final step of the ERA is completed at the end of the Phase 2 activities. The following text describes the steps that will be completed during each phase of the investigation.

Steps 1 through 3 will be conducted following completion of the Phase 1 investigation. Steps 1 and 2 complete the screening ERA, while Step 3 represents the first step of the baseline ERA.

Data collected during 1999 site investigation and the Phase 1 investigation will be considered in Steps 1 through 3 of the ERA. It is anticipated that, based on an initial review of the existing data, additional surface water and sediment data will be needed in order to characterize the risks in Steps 1 through 3 of the ERA. A more definitive review of existing data will be conducted prior to the Phase 1 investigation and include a site visit to select appropriate sampling locations.

Steps 1 through 3 will include a review of surface soil, sediment, and surface water data. Groundwater data will be screened if it is determined that groundwater is potentially discharging to surface water.

1) Steps 1 through 3 of the ERA will then evaluate the potential risks associated with both direct exposure and indirect exposure (food web exposure) to chemicals originating from the site. Food web exposure will use literature-based models to estimate exposure.

2) Step 4 (Study Design and DQO), Step 5 (Field Verification of Sampling Design), and Step 6 (Site Investigation) will be completed as part of the planning for the Phase 2 site investigation (if determined to be necessary to further address ecological risk at the site based on the results of Steps 1 through 3). At that time, additional sampling will be proposed, as necessary, to further characterize the potential risks indicated in Steps 1 through 3.

3) Steps 7 and 8 will be conducted following completion of the Phase 2 investigation and will focus on the evaluation of additional data collected during the Phase 2 investigation.

This subtask includes conducting Steps 1 through 3 of the ERA consistent with *USEPA Guidance for Superfund 1997*. We have assumed that one site visit will be necessary for a qualitative site characterization and the identification of Phase 1 surface water and sediment sampling locations. This site visit will be concurrent with the site visits for selection of the remaining sampling locations and for wetland delineation. This will ensure that the three teams coordinate their activities and the selection of sampling locations in relation to environmental site conditions (i.e., wetland areas and any identified habitats) and the Phase 1 investigation objectives.

Site characterization activities will include a search of existing state and federal databases for the

identification of threatened/endangered species that could be impacted by the site. Data collected during the 1999 site inspection and the Phase 1 site investigation will be evaluated for use in the ERA. In addition to direct screening of media (e.g., soil, sediment) concentrations, this subtask includes running food web models for up to six receptors during Steps 2 and 3 risk calculations. The toxicity screening values that will be used in the ERA consist of standard values available in the open scientific literature. Site data will be grouped by media (one data grouping for each media) for evaluation. Finally, this subtask includes one conference call with EPA to discuss the Phase 1 ERA outcome and our recommendations for the Phase 2 ERA activities.

Quantity Estimate

Labor - The labor hours estimated to be needed to accomplish the activities under this subtask are based on the assumptions described below.

One site visit to select appropriate surface water and sediment sampling locations and for qualitative site characterization and identification of on site habitats will require 24 P3 LOE hours.

The following will be performed: qualitative review and evaluation of the information collected during the site visit; review of relevant historical site literature; search of existing state/federal databases for identification of threatened and endangered species that could be affected by site-related chemicals. This activity will require 12 P3 LOE hours and 10 P2 LOE hours.

A single conceptual model for the site will be developed based on the obtained information. This estimate includes 8 P3 LOE hours and 8 P2 LOE hours.

Screening values for soil, sediment, and water will be developed using standard literature-based values modified, as appropriate, for site-specific conditions (e.g., surface water hardness). Screening value development is estimated to require 10 P3 LOE hours and 14 P2 LOE hours.

Relevant site and background data collected during the 1999 site inspection and data collected during the Phase 1 investigation will be evaluated. Evaluation includes comparing direct exposure values to chemical concentrations for surface soil, sediment, surface water, and groundwater. Up to 6 receptors will be evaluated for foodweb exposure pathways including calculations of food web exposure risks. One site-related data grouping is assumed for each media. This activity will require 24 P3 LOE hours and 40 P2 LOE hours.

All pathways/receptors evaluated in Step 2 will be evaluated during Step 3 using the same data groupings. Risks will be evaluated and uncertainties identified. This activity will require 32 P3 LOE hours and 16 P2 LOE hours

The site model will be refined based on the conducted data analyses and results this will include 12 P3 LOE hours and 8 P2 LOE hours.

The summary of the results of the Phase 1 ERA will be included in the Phase 1 TM and will recommend steps for the Phase 2 assessment. This activity will require 32 P3 LOE hours.

Senior technical support for ERA activities will require 6 P4 LOE hours and 4 P3 LOE hours.

One conference call is budgeted for the PM and ERA lead to discuss with EPA the outcome/implications of the Phase 1 ERA and the recommended steps for the Phase 2 assessment. This activity will require 8 P3 LOE hours and 1 P2 LOE hour.

We have assumed that all comments on the Phase 1 ERA will be addressed as part of performing the Phase 2 ERA.

The PM will require 26 P3 LOE hours to coordinate these activities.

Based on the above assumptions, this subtask is estimated to require the following number of labor hours to complete: 6 P4 hours, 192 P3 hours, 97 P2 hours.

Travel -Travel to the site is included to implement the activities described in this subtask. Estimates of the travel costs are detailed in Table 1 located in Volume II of this WP.

Consumables- Consumable materials must be purchased in order to implement the activities described in this subtask. Estimate of the consumable materials costs are detailed in Table 2 located in Volume II of this WP. Personal protective equipment is assumed to come from the pool purchased under the site reconnaissance subtask.

Equipment Rental - Equipment must be rented in order to implement the activities described in this subtask. However, because the site visit under this subtask is planned at the same time as the site visits for site reconnaissance and wetland delineation, it is assumed that equipment can be shared between all three teams and the equipment costs are included under the site reconnaissance subtask.

Estimates of the equipment rental costs are detailed in Table 3 located in Volume II of this WP.

Deliverables

The following deliverable will be prepared during this subtask: (1) TM detailing the results of the ERA.

The deliverable will be incorporated into the TM to be prepared at the completion of the Phase 1 activities.

Section 3
Schedule

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Section 3
Schedule and Deliverables

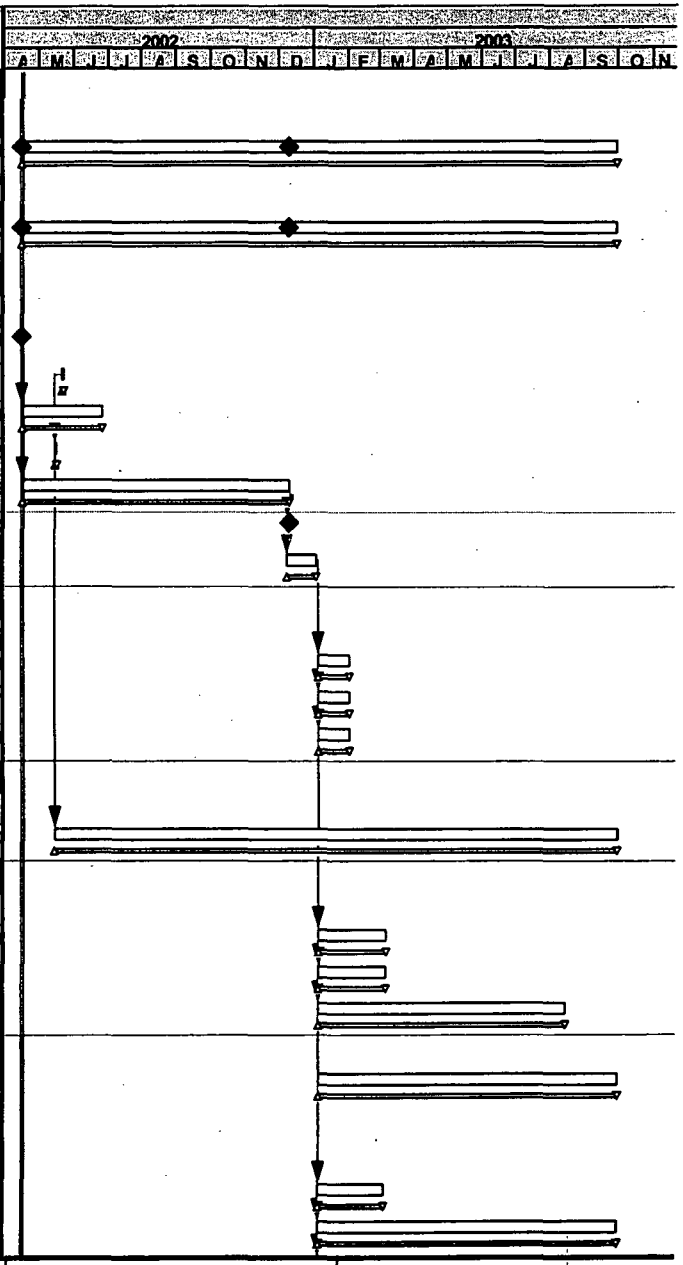
Figure 3-1 describes the schedule for completing the Phase1 activities, the LOE estimates, and the proposed Work Breakdown Structure (WBS) required by the SOW. Supporting detail for cost estimates associated with this WBS is presented in Volume II of this revised WP in the form of computerized cost estimate printouts from CH2M HILL's project control system.

Table 3-1 presents the Schedule of Deliverables for Phase 1 of the remedial investigation being conducted under this WA. We have assumed that the deliverable time frames for the DE.DE and RA.RA tasks will be 60 days following receipt of all validated analytical results from the laboratory.

Table 3-1
Schedule of Deliverables

Task	Activity ID	Deliverable	Qty	Delivered
1.1.4.1	PPWP040	RI/FS Work Plan – Phase # 1	5	June 26, 2002
1.1.4.2	PPWP040	Revised RI/FS Work Plan – Phase1	5	Within 15 days after receipt of EPA comments
1.2.1	PPSP010	Site Management Plan	3	30 days after approval of RI/FS Work Plan
1.2.2	PPSP020	Health and Safety Plan	3	30 days after approval of RI/FS Work Plan
1.2.3	PPSP030	Sampling and Analysis Plan	3	30 days after approval of RI/FS Work Plan
6.4	DEDE040	Phase 1 Technical Memorandum	3	75 days after receipt of all analytical results from laboratory
7.1.1	RARA010	Draft Human Health Risk Assessment Report – RAGS Tables 1 and 2	3	60 days after receipt of all analytical results from laboratory
7.2.1	RARA020	Draft Ecological Risk Assessment Report – Steps 1 - 3	3	60 days after receipt of all analytical results from laboratory

Activity ID	Activity Description	% Comp	Orig Dur	Early Start	Early Finish	Budgeted LOEH	Budgeted Cost
Diamond Head							
173044 - Diamond Head (112)							
Subtotal		0	381	16APR02	30SEP03	7,738.00	1,135,997.00
Task 1 (PP) - Project Planning and Support							
Subtotal		0	381	16APR02	30SEP03	2,544.00	284,927.64
(PP.WP) - Work Planning							
PPWP005	Receive Work Assignment	0	0	16APR02		0.00	0.00
PPWP010	Attend Kickoff/Scoping Meeting	0	1	22MAY02*	22MAY02	87.00	10,242.61
PPWP020	Evaluate Existing Information	0	52	16APR02	26JUN02	125.00	13,965.00
PPWP030	Conduct Site Visit	0	1	16MAY02	16MAY02	32.00	4,182.62
PPWP040	Develop RI/FS Work Plan and Cost Estimate	0	171	16APR02	10DEC02	390.00	43,460.06
PPWP045	Submit Work Plan to EPA	0	0		10DEC02	0.00	0.00
PPWP046	EPA Approval of Work Plan	0	19	10DEC02	03JAN03	0.00	0.00
(PP.SP) - Site Specific Plans							
PPSP010	Develop Site Mangement Plan	0	21	06JAN03	03FEB03	80.00	8,102.30
PPSP020	Develop Health and Safety Plan	0	21	06JAN03	03FEB03	20.00	2,122.87
PPSP030	Develop Sampling and Analysis Plan	0	21	06JAN03	03FEB03	425.00	47,965.78
(PP.PM) - Project Management							
PPPM010	Prepare Monthly Status Reports	0	359	16MAY02	30SEP03	336.00	39,486.20
(PP.SU) - Procurement of Subcontracts							
PPSU010	Identification and Procurement of Subcontractors	0	45	06JAN03	07MAR03	367.99	39,369.69
PPSU020	Develop Subcontractor QA/QC Program	0	45	06JAN03	07MAR03	191.99	23,988.18
PPSU030	Perform Subcontractor Management	0	160	06JAN03	15AUG03	489.02	52,062.33
Task 2 (CR) - Community Relations							
Subtotal		0	192	06JAN03	30SEP03	184.00	21,745.52
(CR.CR) - Community Relations							
CRCR010	Community Relations Plan	0	44	06JAN03	06MAR03	72.00	8,532.84
CRCR020	Public Meeting Support	0	192	06JAN03	30SEP03	56.00	6,606.34



Start Date 16APR02
Finish Date 30SEP03
Data Date 16APR02
Run Date 10DEC02 14:46

Early Bar
Target Bar
Progress Bar
Critical Activity

1120

Sheet 1 of 3

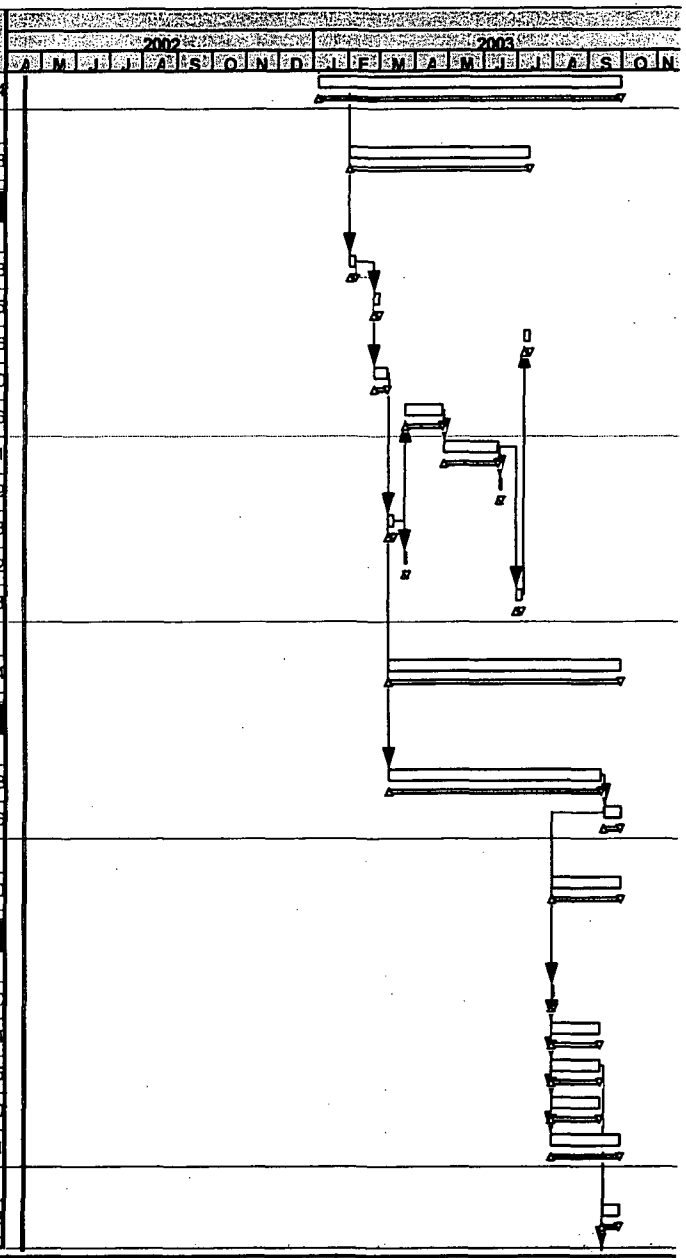
US EPA Region 6

Response Action Contract

Primavera Systems, Inc.

300092

Activity ID	Activity Description	% Comp	Orig Dur	Early Start	Early Finish	Budgeted LOEH	Budgeted Cost
CRCR030	Fact Sheets Preparation	0	192	06JAN03	30SEP03	55.00	6,606.34
Task 3 (FI) - Field Investigation							
Subtotal		0	115	03FEB03	11JUL03	2,794.00	599,122.28
(FI.FI) - Field Investigation							
FIFI010	Identify Field Sprt. Equip, Supplies, Facilities	0	5	03FEB03	07FEB03	172.00	16,185.43
FIFI020	Mobilization	0	5	24FEB03	28FEB03	290.00	57,513.95
FIFI030	Demobilization	0	5	07JUL03	11JUL03	106.00	10,998.86
FIFI040	Perform Site Reconnaisance	0	10	24FEB03	07MAR03	226.00	47,045.20
FIFI050	Conduct Geological Investigations	0	25	24MAR03	25APR03	1,192.00	299,445.36
FIFI060	Conduct Hydrogeological Investigations	0	35	28APR03	13JUN03	462.00	66,499.11
FIFI070	Conduct Waste Investigation	0	1	16JUN03	16JUN03	18.00	2,306.99
FIFI080	Conduct Utility Clearance	0	5	10MAR03	14MAR03	44.00	12,421.53
FIFI090	Conduct Ecological Investigation	0	2	24MAR03	25MAR03	152.00	18,490.92
FIFI100	Dispose of Investigation-Derived Waste	0	5	30JUN03	04JUL03	132.00	58,214.93
Task 5 (AN) - Analytical Sppt / Data Validation							
Subtotal		0	147	10MAR03	30SEP03	236.00	24,226.44
(AN.AN) - Analytical Sppt/Data Validation							
ANAN010	Sample Management	0	135	10MAR03	12SEP03	201.00	20,531.18
ANAN020	Data Validation	0	12	15SEP03	30SEP03	35.00	3,695.26
Task 6 (DE) - Data Evaluation							
Subtotal		0	43	01AUG03	30SEP03	1,619.00	172,305.90
(DE.DE) - Data Evaluation							
DEDE005	Receive Data From EPA	0	1	01AUG03	01AUG03	0.00	0.00
DEDE010	Data Usability Evaluation	0	30	01AUG03	11SEP03	92.00	9,626.64
DEDE020	Data Reduction, Tabulation and Evaluation	0	30	01AUG03	11SEP03	875.00	91,491.55
DEDE030	Modeling	0	30	01AUG03	11SEP03	0.00	0.00
DEDE040	Technical Memorandum (Data Evaluation Report)	0	43	01AUG03	30SEP03	652.00	71,187.71
Task 7 (RA) - Assessment of Risk							
Subtotal		0	12	15SEP03	30SEP03	361.00	43,669.22



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Finish Date 30SEP03
Data Date 16APR02
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Early Bar
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Progress Bar
Critical Activity

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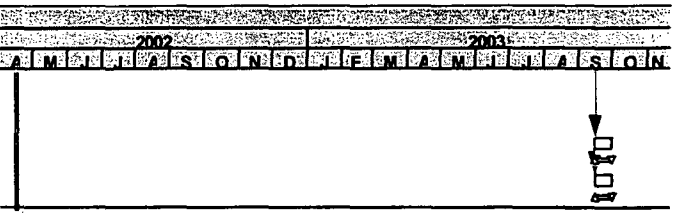
US EPA Region 6

Response Action Contract

Activity ID	Activity Description	% Comp	Orig Dur	Early Start	Early Finish	Budgeted LOEH	Budgeted Cost
(RA.RA) - Assessment of Risk							
RARA010	Draft Human Health Risk Assessment Report	0	12	15SEP03	30SEP03	66.00	7,139.35
RARA020	Draft Ecological Risk Assessment Report	0	12	15SEP03	30SEP03	295.00	36,529.87



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Finish Date	30SEP03
Data Date	16APR02
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Primavera Systems, Inc.

Early Bar
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Progress Bar
Critical Activity

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US EPA Region 6

Response Action Contract

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Appendix A
Statement of Work

300095

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STATEMENT OF WORK FOR REMEDIAL INVESTIGATION / FEASIBILITY STUDY

Diamond Head Oil, Kearny, New Jersey

February 1, 2002

Work Assignment Number: 112-RICO-02KK
EPA ID#NJD092226000
Spill No:02KK

INTRODUCTION

Site Description

The Site is inactive and consists of approximately 15 acres of undeveloped land located in the Hackensack Meadowlands. The Site, an oil reprocessing facility, was in operation from February 1, 1946 to early 1979.

During facility operations, two aboveground storage tanks and possibly underground pits were used to store oily wastes. These wastes were intermittently discharged directly to adjacent properties, including the wetland area to the south of the Site, creating an oil lake.

In 1968, the New Jersey Department of Transportation (NJDOT) acquired the property south of the Site, and in 1977, when beginning construction of I-280, reportedly removed nine million gallons of oil-contaminated water and five to six million cubic yards of oily sludge from the lake. It is also reported that during the construction of I-280, an underground lake of oil-contaminated ground water was found extending from the eastern limits of the NJDOT right-of-way to Franks's Creek on the west.

From the close of operations in 1979 until 1982, the abandoned site was not completely fenced. During this time, it was reported that dumping of waste oils and other debris took place on site. Eastern Chemical Co. was hired to clean up the site in May 1982. In order to do so, the material in the tanks was analyzed and found to contain polychlorinated biphenyls (PCBs) at a concentration of 206 parts per million (ppm). Subsequent analyses revealed the presence of PCBs at concentrations over 3,100 ppm. Approximately 7,500 gallons of material were pumped out of the tanks and disposed off site. Also in May 1982, 27 tons of contaminated soil were removed.

Background information indicates that previous investigations have been conducted at the site; including a sampling event conducted by the New Jersey Department if Environmental Protection (NJDEP), and Environmental Site Characterization conducted by Killiam Associates, and a Site inspection conducted by EPA's Region II Field Investigation Team (FIT). During these investigations, ground water, surface water/sediment, surface/subsurface soil, liquid waste and solid waste samples were collected. Analytical results of these samples indicated the presence of volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs), pesticides, PCBs, and metals.

In December 1999 EPA conducted an Expanded Site Inspection (ESI) at the site. During the ESI, EPA collected surface/subsurface soil and ground water samples from 20 borings advanced throughout the site. EPA also collected sediment samples from the on-site wetland/pond area as well as from the wetland area extending along the southern perimeter of the site. Analytical results indicated the presence of VOCs, SVOCs, pesticides, PCBs, and metals. An observed release to surface water is documented by chemical analyses of sediment samples collected from wetlands along the southern and western boundaries of the site. Level II concentration of lead and zinc are documented to 0.19 mile of wetland frontage located along the southern perimeter of the site.

Purpose

The purpose of this Statement of Work (SOW) is to set forth the requirement for conducting a Remedial Investigation/Feasibility Study (RI/FS) to select a remedy to eliminate, reduce, or control risks to human health and the environment. This SOW is designed to provide the framework for conducting the RI/FS activities at the Dimaond Head Oil site. The goal is to develop the minimum amount of data necessary to support the selection of an approach for site remediation and then to use this data that results in a well-supported Record of Decision (ROD) within 18 months after approval of the Project Management and Work Plans. The estimated completion date for this work assignment is October 31, 2003.

General Requirements

The contractor shall conduct the RI/FS in accordance with this SOW and all other relevant guidance used by EPA in conducting an RI/FS. The primary contact for this work assignment is Grisell V. Díaz-Cotto, WAM Region 2, Tel. 212-637-4430; the secondary contact is Tom Reilly, Project Officer, Region 6, Tel. 214-665-8307. The Contracting Officer for this contract is Ms. Cora Stanley, Region 6. Ms. Stanley may be contacted at 214-665-7464.

A summary of the major deliverables and a suggested schedule for submittals are attached (Attachment 1). The contractor shall submit the major deliverables using the form Transmittal of Documents for Acceptance by EPA, Attachment 3.

Specifically, the RI/FS involves the investigation and study of the impact of the refining and sale of used oil and petroleum products. drum washing operations and residuals in the following pathways: surface and subsurface soils, and groundwater. Contamination in the subsurface soils is documented in previous investigations. Data gaps exist in groundwater and subsurface soils.

The contractor shall furnish all necessary and appropriate personnel, materials, and services needed for, or incidental to, performing and completing the RI/FS.

A list of primary guidance and reference material is attached (Attachment 3). In all cases, the contractor shall use the most recently issued guidance.

The contractor shall communicate at least weekly with the Work Assignment Manager or Remedial Project Manager (WAM/RPM), either in face-to-face meetings or through conference calls.

The contractor shall notify the CO, PO, and WAM when 75 percent of the approved work assignment budget has been expended and when 95 percent has been expended.

EPA shall provide oversight of contractor activities throughout the RI/FS. EPA review and approval of deliverables is a tool to assist this process and to satisfy, in part, EPA's responsibility to provide effective protection of public health, welfare, and the environment. EPA shall review deliverables to assess the likelihood that the RI/FS will achieve its goals and that its performance requirements have been met. Acceptance of deliverables by EPA does not relieve the contractor of responsibility for the adequacy of the deliverables.

Record-Keeping Requirements

The contractor shall maintain all technical and financial records for the RI/FS in accordance with the contract. At the completion of the RI/FS, the contractor shall submit three bound copies of the official record of the RI/FS Report, and one copy of the major deliverable in electronic format (to be determined by the WAM) to the EPA Records Manager in accordance with the requirements of the contract, Section D.1, "Submission of the Deliverable on Floppy Disk." Technical and financial records must be able to support decisions and expenditures made during the RI/FS, as well as during cost recovery.

Project Closeout

At the completion of the RI/FS work assignment, the contractor shall perform all necessary project closeout activities as specified in the contract. These activities may include closing out any subcontracts, indexing and consolidating project records and files as required, and providing a technical and financial closeout report to EPA. Final costs shall be reported to EPA (on disk) broken down into the cost for each element of the Work Breakdown Structure (WBS) (Attachment 2) for this work assignment.

Task 1 Project Planning and Support

The purpose of this task is to determine how the RI/FS will be managed and controlled. The following activities shall be performed as part of the project planning task:

1.1 Project Planning. This task includes efforts related to project initiation.

1.1.1 Attend Scoping Meeting. The contractor shall contact the WAM within 5 calendar days after receipt of the work assignment to schedule the scoping meeting. The contractor shall attend a kickoff meeting to be held at the specified EPA Region 2 Office (in person or via teleconference to be determined by the WAM) after receipt of the work assignment. It is anticipated that 2 - 3 contractor personnel will participate in the scoping meeting.

1.1.2 Evaluate Existing Information. The contractor shall review available information pertaining to the site. The contractor shall obtain the necessary information from the RPM. The contractor shall utilize information and reports developed by the NJDEP to the maximum extent possible. The contractor shall supplement existing data and information and avoid duplicating work already performed by the NJDEP. EPA WAM will provide a copy of the NJDEP reports to the contractor. Contractor may send one field team leader to NJDEP office in Trenton, NJ to review historical photographs at the Aerial Photo and Map Library.

1.1.3 Conduct Site Visit. The contractor shall conduct a 1-day site visit during the project planning phase to develop a conceptual understanding of the site and the RI/FS scope and requirements. It is anticipated that 2 contractor personnel will attend the site visit (i.e., site manager and geologist/hydrogeologist), and that no overnight lodging will be needed.

1.1.4 RI/FS Work Plan

1.1.4.1 Develop RI/FS Work Plan. The contractor shall prepare and submit a RI/FS Work Plan within 30 calendar days after receipt of the work assignment (WA). The contractor shall use information from the appropriate EPA guidance, and technical direction provided by the EPA WAM/RPM as the basis for preparing the RI/FS Work Plan. The contractor shall submit one copy of the work plan to the Contracting Officer (CO), Project Officer (PO) and Work Assignment Manager (WAM). Throughout this document some tasks are designated as "[not used]." These tasks will be activated in the future by separate work plan revision and subsequent work assignment revision (WAF) form.

1.1.4.2 Develop Narrative. The RI/FS Work Plan shall include a comprehensive description of project tasks, the procedures to accomplish them, project documentation, and project schedule. The contractor shall use their quality assurance/quality control (QA/QC) systems and procedures to assure that the work plan and other deliverables are of professional quality requiring only minor revisions. Specifically, the Work Plan shall include the following:

- Identification of RI/FS project elements including planning, design, and activity reporting documentation; field sampling and analysis activities, and treatability study activities. Output of this task will be a detailed work breakdown structure of the RI/FS project.

- The contractor's technical approach to each task to be performed, including a detailed description of each task; the assumptions used; any information to be produced during and at the conclusion of each task; and a description of the work products that will be submitted to EPA. Information shall be presented in a sequence consistent with SOW.

- A schedule with specific dates for completion of each required activity and submission of each deliverable required by the SOW. This schedule shall also include information regarding timing, initiation, and completion of all critical path milestones for each activity and deliverable and the expected review time for EPA.

- A list of key contractor personnel providing support on the work assignment.

- In conjunction with preparation of the Work Plan, the contractor shall also prepare and submit a work plan budget. This work plan budget shall follow the work breakdown structure for this assignment as indicated in the statement of work, and shall contain a detailed cost breakdown, by subtask, of the direct labor costs, subcontract costs, other direct costs, projected base fee and award fee pool, and any additional specific cost elements required for performance of each of the subtasks under this statement of work. Other direct costs shall be broken down into individual cost categories as required for this work assignment, based on the specific cost categories negotiated for this contract. The work plan budget shall contain a detailed rationale describing the contractor's assumptions for estimating the level of effort (including professional/technical levels and skill mix), subcontract amounts, and other direct cost amounts for each subtask under this SOW.

1.1.4.2 Prepare Revised Work Plan (if necessary)

1.1.4.2.1 Work Plan Negotiation Meeting. The contractor shall attend a Work Plan negotiation meeting hosted by Region 6 at a specified EPA office in Region 2 or via teleconference. EPA and the Contractor will discuss and agree upon the final technical approach and costs required to accomplish the tasks outlined in the SOW.

1.1.4.2.2 Prepare & Submit Revised Work Plan. The contractor shall prepare and submit a revised work plan incorporating the agreements made in the negotiation meeting.

1.2 Preparation of Site-Specific Plans

1.2.1 Develop Site Management Plan. After EPA approval of the RI/FS Work Plan, the contractor shall prepare a Site Management Plan (SMP) that provides EPA with a written understanding of how access, security, contingency procedures, management responsibilities, and waste disposal are to be handled.

1.2.1.1 Develop Pollution Control and Mitigation Plan. The contractor shall prepare a Pollution Control & Mitigation Plan that outlines the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released off-site during the implementation of the RI.

1.2.1.2 Develop Transportation and Disposal Plan (Waste Management Plan). The contractor shall prepare a Transportation & Disposal Plan that outlines how

wastes that are encountered during the RI will be managed and disposed of. The contractor shall specify the procedures that will be followed when wastes will be transported off-site for storage, treatment, and/or disposal.

1.2.2 Develop Health and Safety Plan. Prepare a site-specific HASP that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 40 CFR 300.150 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and 29 CFR 1910.120 1(1) and (1)(2). A task-specific HASP must also be prepared to address health and safety requirements for site visits.

1.2.3 Develop Sampling and Analysis Plan

1.2.3.1 Quality Assurance Project Plan. The contractor shall prepare a Quality Assurance Project Plan (QAPP) in accordance with current EPA Region 2 RAC QAPP guidance and procedures and the contractor's approved quality management plan and quality assurance project plan for this contract.. The QAPP shall describe the project objectives and organization, functional activities, and quality assurance/quality control (QA/QC) protocols that shall be used to achieve the desired Data Quality Objectives (DQOs). The DQOs shall, at a minimum, reflect use of analytical methods for identifying contamination and addressing contamination consistent with the levels for remedial action objectives identified in the NCP. The QAPP developed for the RI/FS should be referenced or adapted whenever possible when preparing the QAPP for the RI/FS.

1.2.3.2 Field Sampling Plan. Prepare a Field Sampling Plan (FSP) that defines the sampling and data collection methods that shall be used for the project. The FSP shall include sampling objectives; sample locations and frequency; sampling equipment and procedures; sample handling and analysis; and a breakdown of samples to be analyzed through the Contract Laboratory Program (CLP) and through other sources, as well as the justification for those decisions. The FSP shall consider the use of all existing data and shall justify the need for additional data whenever existing data will meet the same objective. The FSP shall be written so that a field sampling team unfamiliar with the site would be able to gather the samples and field information required. The FSP developed for the RI/FS must be referenced or adapted whenever possible when the FSP is prepared for the RI/FS; the contractor shall document any required changes to the FSP in a memorandum to the WAM/RPM.

1.2.3.3 Data Management Plan. The contractor shall prepare a Data Management Plan that outlines the procedures for storing, handling, accessing, and securing data collected during the RI.

1.2.4 Pathway Analysis Report (PAR). The contractor shall prepare a Pathways Analysis Report in accordance with OSWER Directive 9285.7-01D-1 dated December 17, 1997 (or more recent version) entitled, "Risk Assessment Guidelines for Superfund Part D." The conceptual model (Table 1 of RAGS Part D) shall be submitted after the draft work plan is approved. Tables 2 through 6 shall be submitted as part of a technical memo after completion of Task 6.4. The tech memo shall describe the data, assumptions, where values were obtained, etc.

1.3 Project Management

The contractor shall perform general work assignment management including management and tracking of costs, preparation of Monthly Progress Reports, attendance at project meetings, and preparation and submittal

of invoices. It is anticipated that the period of performance for this project is from May 1, 2002 through October 31, 2003.

1.3.1 Prepare Monthly Status Reports. The contractor shall prepare monthly progress reports in accordance with the requirements under the contract.

1.3.1.1 Document Cost and Performance Status. The contractor shall document the technical progress and status of each task in the WBS for the reporting period in accordance with contract requirements. The contractor shall report costs and level of effort (by P-level) for the reporting period as well as cumulative amounts expended to date.

1.3.1.2 Prepare and Submit Invoices. Monthly invoices will be prepared and submitted in accordance with the level of detail as specified in the contract.

1.3.2 Work Assignment Closeout. The contractor shall perform the necessary activities to closeout the work assignment in accordance with contract requirements.

1.3.2.1 Package and Return Documents to Government. The contractor shall box up all draft and final versions of all deliverables and raw data information and send them to the EPA Records Center or as directed in the Work Assignment Closeout Notification (WACN).

1.3.2.2 Prepare Work Assignment Closeout Report (WACR). The contractor shall prepare and submit a WACR as directed in the WACN.

1.4 Subcontract Procurement and Support Activities

1.4.1 Identification and Procurement of Subcontractors. Procure and administer the necessary subcontracts, including, but not limited to the following:

1.4.1.1 Drilling Subcontractor
1.4.1.2 Surveying Subcontractor
1.4.1.3 Geophysical Subcontractor
1.4.1.4 Site Preparation Subcontractor
1.4.1.5 Analytical Services Subcontractor(s)
1.4.1.6 Waste Disposal Subcontractor
1.4.1.7 Other(s)

1.4.2 Develop Subcontractor QA/QC Program. The contractor shall review, approve, and monitor the subcontractor's QA/QC program and conduct audits, as required.

1.4.3 Perform Subcontract Management. The contractor shall perform the necessary management and oversight of any subcontractor(s) needed for this RI. The Contractor shall institute procedures, monitor progress, and maintain systems and records to ensure that the work proceeds according to contract requirements. The contractor shall review and approve subcontractors' invoices and issue any necessary contract modifications.

Task 2 Community Relations

This task includes technical support provided by the contractor during public/availability meeting(s). The contractor shall provide community relations support to EPA throughout the RI/FS in accordance with *Community Relations in Superfund-A Handbook*, June 1988. For budgeting purposes the contractor shall assume that they will provide technical support at 2 public/availability meeting(s) and each meeting not requiring an overnight stay.

2.0 Community Interviews

2.0.1 Community Interviews Preparation. The contractor shall review relevant background documents as provided by the EPA WAM and shall make the arrangements for and provide logistical support to the EPA WAM and Community Relations Coordinator, who will conduct interviews with the appropriate governmental officials (federal, state, county, township, city) environmental groups, local broadcast and print media and any other relevant individuals or groups either in person or by telephone. Contractor shall telephone the interviewees selected by EPA to schedule appointments for the interview, and arrange for a location (if necessary) to hold the interviews. Contractor shall provide one person to take notes of the responses during the interview. Assume 15 interviews lasting 30 minutes each.

2.0.2 Community Interviews Questions [not required]. The interview questions will be prepared by EPA.

2.1 Community Relations Plan. The contractor shall prepare a draft and final community relations plan (CRP) which will address the following activities:

2.1.1 Draft CRP - The contractor shall develop a draft CRP, using the interview summaries and the CRP at the Welsbach site as a model (EPA WAM to provide a copy), that presents an overview of the community's concerns and includes the following elements: 1) site background including location, description, and history; 2) community overview including a community profile, concerns and involvement; 3) community involvement objectives and planned activities with a schedule to accomplish those objectives; 4) mailing list of contacts and interested parties; 5) name and address of the information repositories and public meeting facility locations; 6) list of acronyms; and 7) a glossary.

2.1.2 Final CRP - The contractor shall submit the final CRP in accordance with final comments from EPA.

2.2 Public Meeting Support. The contractor shall make the arrangements for public meetings/availability sessions/open house including the selection and procurement of a meeting space. For budgeting purposes, the contractor shall assume 2 public meetings and 4 availability sessions. The contractor shall perform the following activities:

2.2.1. Attend public meetings or availability sessions, provide recording and/or stenographic support, prepare draft and final meeting summaries, prepare presentation materials/handouts. Contractor shall participate in the public meetings by making technical presentations of site information. Contractor shall attend the dry run for the public meetings at the EPA Region Office in NY.

2.2.2 Prepare Draft and Final Public Meeting Visual Aids. The contractor shall develop draft visual aids (i.e., transparencies, slides, and handouts). For budgeting purposes, the contractor shall assume 20 overhead transparencies, 25 slides, and 350 pages (total) of handouts for each public meeting. Visual aids may be in electronic format.

2.2.3 Final Public Meeting Visual Aids. The contractor shall develop final visual aids incorporating all EPA comments.

2.2.4 The contractor shall make the arrangements for public meetings including the selection and reservation of a meeting space, and providing audio/visual equipment. For budgeting purposes the contractor shall assume 2 public meetings and 4 public availability sessions (2 days consisting of a morning and evening session). Assume a public meeting space for an attendance of 35-40 individuals.

2.2.5 The contractor shall reserve a court reporter for the public meetings. A full-page original and a "four on one" page copy, along with a 3.5 inch diskette of the transcripts shall be provided to EPA, with additional copies placed in the information repositories as required. The diskette shall be provided in Word Perfect 8.0 or most recent EPA-approved word processing format.

2.3 Fact Sheet Preparation

2.3.1 Draft Fact Sheets - The contractor shall assist in the preparation of draft fact sheets in accordance with the approved CRP for the site. The contractor shall provide support in research, information, edit, design, lay out, and photocopy of the fact sheets. For budgeting purposes, the contractor shall assume 4 fact sheets 2 to 4 pages in length with 2 illustrations or figures per fact sheet.

2.3.2 Final Fact Sheets. The contractor shall prepare final fact sheets incorporating all EPA comments. The contractor shall attach mailing labels to the final fact sheets before delivering them to EPA from where they will be mailed.

2.4 Proposed Plan Support.

2..4.1 The contractor shall provide administrative and technical support for the preparation of the draft and final Proposed Plan describing the preferred alternative and other alternatives evaluated in the Feasibility Study.

2.4.2 The Plan shall be prepared in accordance with the NCP and the EPA *Community Relations in Superfund--A Handbook* (most current version). The plan shall also describe opportunities for involvement in the Record of Decision. The contractor shall prepare 2 draft Proposed Plan(s). The contractor shall prepare 1 final Proposed Plan incorporating all EPA comments.

2.5 Public Notices. The contractor shall, when directed by the WAM, coordinate and assist in the preparation of Public Notices in a local newspaper serving the site community. All public notices must be approved by EPA before publication. The contractor shall arrange for newspaper announcement(s)/public notice(s) in support of the various public meetings/availability sessions. The contractor shall assume the development of 2 newspaper announcements in the most widely read local newspaper(s). For budgeting purposes, the contractor shall assume the notice is placed in the most widely-read newspaper.

2.6 Responsiveness Summary Support. The contractor shall provide administrative and technical support for the site Responsiveness Summary. The contractor shall provide assistance in compiling and summarizing comments received during the public comment period on the Proposed Plan and Feasibility Study. Assume 30 separate comments (including duplicate comments).

Task 3 Field Investigation

Data acquisition entails collecting environmental samples and information required to support the RI/FS. The planning for this task is accomplished in Task 1 - Project Planning and Support, which results in the plans required to collect the field data. Data acquisition starts with EPA's approval of the FSP and ends with the demobilization of field personnel and equipment from the site.

The contractor shall perform the following field activities or combination of activities for data acquisition in accordance with the EPA-approved FSP and QAPP developed in Task 1.

3.1 Mobilization and Demobilization. The contractor shall provide the necessary personnel, equipment, and materials for mobilization and demobilization to and from the site for the purpose of conducting the sampling program under subtask 3.3.2, Field Investigation.

3.1.1 Identify Field Support Equipment, Supplies, and Facilities

3.1.2 Mobilization.
- 3.1.2.1 Site Preparation, includes evaluation of the structural integrity of the Rhodes Drum Building.
- 3.1.2.2 Installation of Utilities
- 3.1.2.3 Construction of Temporary Facilities
- 3.1.2.4 Installation of sign - to be posted at the site providing the appropriate contacts for obtaining information on activities conducted at the site, and for reporting suspected criminal activities.
- 3.1.2.5 Chain link fence - extend existing chain link fence (approx. 2-10 foot sections) to restrict access to the site by trespassers. Install new locks at the three gates.

3.1.3 Demobilization.
- 3.1.3.1 Removal of Temporary Facilities
- 3.1.3.2 Site Restoration

3.2 Field Investigation. The contractor shall conduct environmental sampling which includes the following:

3.2.1 Perform Site Reconnaissance. The contractor shall conduct site surveys including property, boundary, utility rights-of-way, and topographic information. These surveys are to refine the survey data from previous investigations and to ensure the accuracy of the information for the RI/FS.

- 3.2.1.1 Well inventory within 1-mile radius of site (including pumping rate and schedule) Within the site's boundaries, confirm the existence of monitoring wells 1, 4 and 5. Check them for the presence of NAPL and their general condition (including total depths) to determine if they are suitable for sampling and/or if they require development. Replace locks.
- 3.2.1.2 Residential and Municipal Water Supply Well Sampling and analysis
- 3.2.1.3 Land Survey to verify property lines
- 3.2.1.4 Topographic Mapping, particularly off-site properties
- 3.2.1.5 Field Screening, including radiation (soils)

3.2.2 Conduct Geological Investigations (Soils and Sediments). The contractor shall conduct geological investigations of soils to supplement previous investigations and fill in data gaps. Areas of concern include the locations of the former aboveground tanks, former reported underground pits, the NAPL plume, the former building, the landfill, and any other area noted on the EPA historical photograph analysis.

- 3.2.2.1 Collect and analyze Surface Soil Samples
  The contractor shoud assume approximately 65 surface soil samples . All samples in the suspected area of the NAPL plume should be screened for the presence of NAPL using fluorescence testing, shake testing or similar method. Samples should be analyzed for full TAL/TCL constituents plus PCB (based on Aroclors as a first step).
- 3.2.2.2 Collect and analyze Subsurface Soil Samples
  The contractor should assume approximately 35 subsurface soil samples collected to the depth of the estimated ground water table. All samples in the suspected area of the NAPL plume should be screened for the presence of NAPL using fluorescence testing, shake testing or similar method. Samples should be analyzed for full TAL/TCL constituents plus PCB (based on Aroclors as a first step).

3.2.2.3 Soil Boring and Permeability Sampling

3.2.2.4 Test Pit (if deemed necessary WAM)
Delineate the boundaries of the on-site landfill. This task may be accomplished by the excavation of four to six test pits, an estimated 12 feet deep.

3.2.3 Conduct Hydrogeological Investigations (Ground Water). The contractor shall conduct hydrogeological investigations of ground water to supplement previous investigations and fill in data gaps.

3.2.4.1 Install Well Systems
Install approximately six to twelve wells to determine the nature and extent of groundwater contamination. Depending on the lithology at the site, deeper wells may be necessary to determine the presence and extent of contamaintion in the deeper portions of the aquifer (i.e., if no continuous confining unit exists). If the Geoprobe borings did not fully define site lithology, then corings should be collected during well drilling activities. Background wells may be necessary based on the industrial nature of hte surrounding area.

3.2.4.2 Collect and analyze samples
All samples in the suspected area of the NAPL plume should be screened for the presence of NAPL using fluorescence testing, shake testing or similar method. Samples should be analyzed for full TAL/TCL constituents plus PCB (based on Aroclors as a first step).

3.2.4.3 Collect and analyze samples during drilling (e.g., HydroPunch® or equivalent)

3.2.4.4 Conduct Tidal Influence Study

3.2.4.5 Perform Hydraulic Tests (Pump Tests)
Conduct aquifer testing to determine hydraulic characteristics. Slug tests are adequate in the initial stages of the project, however, an aquifer pumping test may be necessary if significant groundwater contamination is found that may require active remediation.

3.2.4.6 Measure Ground-Water Elevation

3.2.4.7 Verify groundwater flowrate and direction
Establish groundwater flow direction in the sahllow aquifer by obtaining groundwater elevations in existing wells. These wells may need to be surveyed unless previous survey data are available.

3.2.4 Conduct Waste Investigation. The contractor shall conduct waste investigations.

3.2.4.1 Collect and analyze Samples (Gas, Liquid, Solid)
Areas of concern include the former building, the landfill, and any other area noted on the EPA historical photograph analysis.

3.2.4.2 Dispose of Derived Waste (Gas, Liquid, Solid)

3.2.5 Conduct Geophysical Investigation. The contractor shall conduct geophysical investigations.

3.2.5.1 Surface Geophysical Activity [can just list these]
Conduct a Geoprobe (or equivalent direct push technology) to determine the site lithology and the nature and extent of the NAPL plume.

3.2.5.2 Magnetometer

3.2.5.3 Electromagnetics

3.2.5.4 Ground-Penetrating Radar

3.2.5.5 Seismic Refraction

3.2.5.6 Resistivity

3.2.5.7 Site Meteorology

3.2.5.8 Cone Penetrometer Survey

3.2.5.9 Radiological Investigation

3.2.8 Conduct Ecological Investigation. The contractor shall conduct ecological investigations.

3.2.8.1 Wetland and Habitat Delineation/function and value assessment

3.2.8.2 Wildlife Observations
3.2.8.3 Community Characterization
3.2.8.4 Identification of Endangered Species

3.2.9 Collect and analyze Contaminated Building Samples. The contractor shall collect and analyze contaminated building samples.

3.2.10 Dispose of Investigation-Derived Waste. Characterize and dispose of investigation-derived wastes in accordance with local, State, and Federal regulations as specified in the FSP (see the Fact Sheet, *Guide to Management of Investigation-Derived Wastes*, 9345.3-03FS (January 1992)).

Task 4 Sample Analysis

The contractor shall arrange for the analysis of environmental samples collected during the previous task. This task includes **ONLY** the cost of the sample analysis. Efforts associated with sample collection is included in task 3, efforts associated with shipment and validation are included in task 5, and efforts associated with data evaluation are included in task 6. The contractor shall analyze the following samples:

4.1 Innovative Methods/Field Screening Sample Analysis
- 4.1.1 Analyze Ground-Water Samples
- 4.1.2 Analyze Soil Samples
- 4.1.3 Analyze Waste (Gas) Samples
- 4.1.4 Analyze Waste (Liquid) Samples
- 4.1.5 Analyze Waste (Solid) Samples

4.2 CLP-Type Laboratory Sample Analysis
- 4.2.1 Analyze Ground-Water Samples
- 4.2.2 Analyze Soil Samples
- 4.2.3 Analyze Waste (Gas) Samples
- 4.2.4 Analyze Waste (Liquid) Samples
- 4.2.5 Analyze Waste (Solid) Samples

Task 5 Analytical Support and Data Validation

The contractor shall arrange for the validation of non-RAS environmental samples collected during the previous task. The sample validation task begins with reserving sample slots in the CLP and the completion of the field sampling program. This task ends with the contractor validating the analytical data received from the laboratory. Data validation of RAS TCL/TAL analytical data will be performed by EPA.

The format for submissions shall be the same used at the Pohatcong site (subject to change by EPA after discussion of Equis data format). The contractor shall perform the following activities or combination of activities:

5.1 Collect, Prepare and Ship Samples. The contractor shall collect, prepare and ship the analytical samples collected under Task 3 in accordance with the approved QAPP.

5.2 Sample Management. The contractor shall provide a sample management function which includes:
- A. Coordinate with appropriate sample management personnel and EPA sample management offices regarding analytical, data validation, and quality assurance issues;
- B. Implement EPA-Approved Laboratory QA Program which provides oversight of in-house and sub-contracted laboratories;
- C. Coordinate with the EPA Sample Management Office (SMO), the Regional Sample Control Coordinator (RSCC), and/or the Division of Environmental Science and Assessment (DESA) regarding analytical, data validation, and quality assurance issues; and

D. Provide Chain of Custody, Sample Retention, and Data Storage functions in accordance with the approved contract-wide QAPP, QMP and contract. The contractor shall ensure accurate chain-of-custody procedures for sample tracking, protective sample packing techniques, and proper sample-preservation techniques.

5.3 Data Validation. The contractor shall validate the data to ensure that the data and chain of custody are accurate and defensible. The contractor shall perform the following activities as part of this subtask:

5.3.1 Review analysis results against validation criteria;

5.3.2 Review the data and make a data usability determination; and

5.3.3 The contractor shall develop a Data Validation Report to the Work Assignment Manager after all the data has been validated.

Task 6 Data Evaluation

The contractor shall organize and evaluate existing data and data gathered during the previous tasks that will be used later in the RI/FS effort. Data evaluation begins with the receipt of analytical data from the data acquisition task and ends with the submittal of the Data Evaluation Summary Report. Specifically, the contractor shall perform the following activities during the data evaluation effort:

6.1 Data Usability Evaluation.

6.1.1 The contractor shall evaluate the usability of the data, including any uncertainties associated with the data.

6.2 Data Reduction, Tabulation, and Evaluation.

6.2.1 The contractor shall evaluate, interpret, and tabulate data in an appropriate presentation format for final data tables. The following shall be used as general guidelines in the preparation of data for the RI report:

1. Tables of analytical results should be organized in a logical manner such as by sample location number, sampling zone, or some other logical format. Groundwater sampling results could be separated into three sets of data, upgradient, on-site, and downgradient. Groundwater analytical results shall be separated into groups based on the hydrogeologic framework such as shallow aquifer upgradient, deep aquifer upgradient, shallow aquifer downgradient and deep aquifer downgradient. Well identification numbers within each set could be ordered according to whatever alpha-numeric system is used for the well identification numbers. Surface/subsurface soil analyses shall be separated according to site location or specific contaminant source and background areas. The contractor shall coordinate the table organization with the EPA WAM;

2. Analytical results shall not be organized by laboratory identification numbers because these numbers do not correspond those used on sample location maps. The sample location/well identification number shall always be used as the primary reference for the analytical results. The sample location number shall also be indicated if the laboratory sample identification number is used;

3. Analytical tables should indicate the sample collection dates;

4. The detection limit shall be indicated in instances where a parameter was not detected;

5. Analytical results shall be reported in the text, tables and figures using a consistent convention such as μg/l for groundwater analyses and mg/kg for soil analyses;

6. The lead agency's protocol for eliminating field sample analytical results based on laboratory/field blank contamination results shall be clearly explained;

7. Discussion of approved sampling results shall not be qualified by suggesting that a particular chemical is a common lab contaminant or was detected in the lab blank. If the reported result has passed QA/QC it shall be considered valid. In cases where the chemical in question was known to have been used and/or disposed of on site, positively identified at high levels in other environmental media, and passes QA/QC protocols, the sampling results shall not be questioned as being due to laboratory contaminants; and

8. Field equipment rinsate blank analyses results shall be discussed in detail if decontamination solvents are believed to have contaminated field samples.

6.3 Modeling. The contractor shall model specific data to assist the EPA in assessment of current and future risks associated with contamination present at the site or to estimate current or future exposure models. (Not needed at this time).

6.3.1 Computer models must accurately represent site conditions if they are to be used to evaluate groundwater contamination problems and/or groundwater remediation alternatives. In order to ensure that a computer model will be representative of site conditions and to prevent the need to revise the computer model, the following information shall be supplied to the EPA WAM for review before the model is run:

1. The objective and scope of the model;
2. Basic documentation for the model to be used;
3. A list of assumptions to be used in generating the model;
4. A list of the model variables and the units in which they are expressed;
5. A list of approximate preliminary input values to be used for the model variables together with the calculations used to determine these input values;
6. A rough map showing the areal extent of the model and the major topographic features to be included;
7. A cross section(s) to illustrate the hydrogeologic framework to be used in the development of the model;
8. The rationale for lateral and vertical boundary conditions such as "no flow" or "constant head" boundaries;
9. Calibration targets for piezometric heads and mass balance;
10. All input assumptions regarding type of contaminants, level of contaminants at the source area at time zero, and mobility factors (for contaminant transport models);
11. A description of the types of sensitivity analyses that will be considered and carried out;
12. References for all sources of data and assumptions used to develop the model; and
13. A list of all significant rivers, streams, lakes, pumping wells and recharge wells or systems in the vicinity of the site that may have an impact on groundwater flow patterns and an explanation of how the model will address these factors.

6.3.2 All of the items mentioned above and related supporting data shall be included in the text or appendices of the final report. Results and problems encountered with computer model sensitivity analyses and calibration shall be discussed in the text. In addition, the following shall be addressed:

1. The initial conditions calibration model should be thoroughly reviewed before remedial alternatives are modeled;

2. Computer models for groundwater extraction systems must include some form of capture zone analysis in order to determine the effectiveness of extraction wells to prevent the further migration of groundwater contamination. An accurate determination of extraction well capture zone cannot be based only on a visual analysis of a predicted potentiometric surface map;

3. Computer model input/output value printouts for each "run" discussed in the text shall be provided in the appendices with an explanation of all numerical units and the type of display;

4. Key maps such as predicted groundwater flow or contaminant concentration maps shall show the site boundary, surface water features, pumping wells and any other features that are required to interpret this information;

5. Copies of the computer model code shall be made available for review upon request; and

6. A discussion of uncertainties and limitations of the computer model results shall be provided as part of the discussion.

6.4 Technical Memorandum (Data Evaluation Report).

6.4.1 The contractor shall evaluate and present results in a Data Evaluation Summary Report and submit to the EPA WAM for review and approval. The EPA WAM should specify the format for submissions if there are Region-specific requirements or if the EPA WAM has specific requirements.

6.4.2 The contractor shall prepare and submit a Technical Memorandum to the EPA WAM if new analytical data needs or significant data problems are identified during the evaluation.

Task 7 Assessment of Risk

The Risk Assessment will determine whether site contaminants pose a current of potential risk to human health and the environment in the absence of any remedial action. The contractor shall address the contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The Risk Assessment will be used to determine whether remediation is necessary at the site, provide justification for performing remedial action, and determine what exposure pathways need to be remediated.

7.1 Human Health Risk Assessment. The contractor shall evaluate and assess the risk to human health posed by site contaminants

7.1.1 Draft Human Health Risk Assessment Report. The contractor shall prepare a draft Human Health Risk Assessment Report that addresses the following:

1. Hazard Identification (sources). The contractor shall review available information on the hazardous substances present at the site and identify the major contaminants of concern.
2. Dose-Response Assessment. Contaminants of concern shall be selected based on their intrinsic toxicological properties.
3. Prepare Conceptual Exposure/Pathway Analysis. Critical exposure pathways (e.g., drinking water) shall be identified and analyzed. The proximity of contaminants to exposure pathways and their potential to migrate into critical exposure pathways shall be assessed.
4. Characterization of Site and Potential Receptors. The contractor shall identify and characterize human populations in the exposure pathways.
5. Exposure Assessment. The exposure assessment shall identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment shall include an evaluation of the likelihood of such exposures occurring and shall provide the basis for the development of acceptable exposure levels. In developing the exposure assessment, the contractor shall develop reasonable maximum estimates of

exposure for both current land use conditions and potential land use conditions at the site.

6. Risk Characterization. During risk characterization, chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, shall be compared to measured levels of contaminant exposure levels and the levels predicted through environmental fate and transport modeling. These comparisons shall determine whether concentrations of contaminants at or near the site are affecting or could potentially affect human health.
7. Identification of Limitations/Uncertainties. The contractor shall identify critical assumptions (e.g., background concentrations and conditions) and uncertainties in the report.
8. Site Conceptual Model. Based on contaminant identification, exposure assessment, toxicity assessment, and risk characterization, the contractor shall develop a conceptual model of the site.

7.1.2 Final Human Health Risk Assessment Report. After the draft Human Health Risk Assessment Report has been reviewed and commented on by EPA, the contractor shall incorporate EPA comments and submit the final Human Health Risk Assessment Report.

7.2 Ecological Risk Assessment. The contractor shall evaluate and assess the risk to the environment posed by site contaminants.

7.2.1 Draft Ecological Risk Assessment Report. The contractor shall prepare a draft Ecological Risk Assessment Report that addresses the following:

9. Hazard Identification (sources). The contractor shall review available information on the hazardous substances present at the site and identify the major contaminants of concern.
10. Dose-Response Assessment. Contaminants of concern should be selected based on their intrinsic toxicological properties.
11. Prepare Conceptual Exposure/Pathway Analysis. Critical exposure pathways (e.g., surface water) shall be identified and analyzed. The proximity of contaminants to exposure pathways and their potential to migrate into critical exposure pathways shall be assessed.
12. Characterization of Site and Potential Receptors. The contractor shall identify and characterize environmental exposure pathways.
13. Select Chemicals, Indicator Species, and End Points. In preparing the assessment, the contractor will select representative chemicals, indicator species (species that are especially sensitive to environmental contaminants), and end points on which to concentrate.
14. Exposure Assessment. The exposure assessment will identify the magnitude of actual or environmental exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment shall include an evaluation of the likelihood of such exposures occurring and shall provide the basis for the development of acceptable exposure levels. In developing the exposure assessment, the contractor shall develop reasonable maximum estimates of exposure for both current land use conditions and potential land use conditions at the site.
15. Toxicity Assessment/Ecological Effects Assessment. The toxicity and ecological effects assessment will address the types of adverse environmental effects associated with chemical exposures, the relationships between magnitude of exposures and adverse effects, and the related uncertainties for contaminant toxicity (e.g., weight of evidence for a chemical's carcinogenicity).
16. Risk Characterization. During risk characterization, chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, shall be compared to measured levels of contaminant exposure levels and the levels predicted through environmental fate and transport modeling.

These comparisons shall determine whether concentrations of contaminants at or near the site are affecting or could potentially affect the environment.

17. Identification of Limitations/Uncertainties. The contractor shall identify critical assumptions (e.g., background concentrations and conditions) and uncertainties in the report.
18. Site Conceptual Model. Based on contaminant identification, exposure assessment, toxicity assessment, and risk characterization, the contractor shall develop a conceptual model of the site.

7.2.2 Final Ecological Risk Assessment Report. After the draft Ecological Risk Assessment Report has been reviewed and commented on by EPA, the contractor shall incorporate EPA comments and submit the final Ecological Risk Assessment Report.

Task 8 Treatability Study/Pilot Testing [not used]

Task 9 Remedial Investigation Report

The Contractor shall develop and deliver a Remedial Investigation (RI) report that accurately establishes the site characteristics such as media contaminated, extent of contamination, and the physical boundaries of the contamination. Pursuant to this objective, the contractor shall obtain only the minimally essential amount of detailed data necessary to determine the key contaminant(s) movement and extent of contamination. The key contaminant(s) must be selected based on persistence and mobility in the environment and the degree of hazard. The key contaminant(s) identified in the RI shall be evaluated for receptor exposure and an estimate of the key contaminant(s) level reaching human or environmental receptors must be made. The contractor shall use existing standards and guidelines such as drinking-water standards, water-quality criteria, and other criteria accepted by the EPA as appropriate for the situation may be used to evaluate effects on human receptors who may be exposed to the key contaminant(s) above appropriate standards or guidelines.

9.1 Draft RI Report. In accordance with the schedule developed in the RI/FS work plan, the contractor shall submit a draft RI Report which includes the following.

A Site Background. The contractor shall assemble and review available facts about the regional conditions and conditions specific to the site under investigation. This should include the following:

1. An index map shall be used to show where the site is located within a state. This could be provided as a separate map or as an inset on a regional site location map.
2. A regional map shall be provided which shows the location of the site relative to nearby residential/industrial areas, public water supply wells, schools, parks, wetlands, surface waters, other hazardous waste sites, etc.
3. A site map shall be included which shows the location of all present and past site structures/features. Labels or a key shall be provided to explain the nature of each site feature. More than one map may be required to show these features if the site has undergone significant operational changes over time.
4. A topographic contour map shall be provided for the site. The scale used on these maps shall provide sufficient detail so that sample locations can be accurately plotted in relation to site features (e.g., 1" = 20'). In this case a small scale map shall be used to show the entire site as well as indicate how the site has been divided into a number of large scale maps.
5. The current and/past status of the site shall be clearly defined.
6. Chemicals and hazardous materials used, stored, disposed of and/or produced at the site shall be listed. Methods of waste disposal shall be described.
7. All previous environmental studies and investigations must be summarized and fully referenced. The summary shall explain why each study was initiated, discuss the key findings and provide any relevant data summaries (chemical analyses, contaminant plume maps, etc.) in the text or in the appendices.

8. A map shall be provided which shows the locations of all previous environmental sampling and monitor well locations. This information shall be provided on maps showing proposed sampling locations.
9. The Federal, state and local regulatory history of the site will be discussed. Key memos, correspondence, court orders and other relevant documents relating to significant regulatory actions shall be clearly referenced. A table will be used to summarize this information in addition to the text.
10. Any previous environmental sampling results shall be summarized. Tables and/or text shall clearly indicate the types of media that were analyzed, sampling dates, analytical parameters, the method detection limits for "non-detect" values. The parties responsible for each round of sampling and analyses shall be clearly identified. Any significant sampling/laboratory QA/QC problems must be also be noted.
11. The findings of EPA's aerial photograph analysis provided in the Environmental Photographic Interpretation Center (EPIC) shall be summarized or included as a appendix. The EPA project manager shall request EPA's EMSL, Las Vegas Lab to conduct an EPIC survey if one has not been provided as funds are available to conduct these aerial photograph analyses for all Superfund sites.
12. Any ecological concerns such as sensitive habitats, wetlands, threatened or endangered species shall be discussed.

B. Investigation. This section of the RI shall cover the following:
1. Field Investigation & Technical Approach
2. Chemical Analysis & Analytical Methods
3. Field Methodologies (includes the following where applicable)
    a. Biological
    b. Surface Water
    c. Sediment
    d. Soil Boring
    e. Soil Sampling
    f. Monitoring Well Installation
    g. Groundwater Sampling
    h. Hydrogeological Assessment
    i. Air Sampling

Presenting Well and Subsurface Boring Log Information

- In developing final well logs from rough field logs, there shall be no attempt to simplify the logs by eliminating data or observations obtained in the field. If necessary additional pages can be included with the well log to explain any drilling problems, unusual observations, detailed stratigraphic descriptions or any other information that helps convey how the boring was installed and the nature of the subsurface conditions that were encountered.

- Boundaries between hydrogeologic units defined in a report shall be annotated on well logs. This will allow the reader to quickly verify the hydrogeologic framework which is presented in the report. Mean sea level elevations shall be provided for ground level and top of casing. Survey grid coordinates shall be provided in addition to a short verbal description of well location (e.g., "50 feet south of aeration lagoon.")

- The well/boring installation method and material shall be completely summarized on the well log and/or well construction diagram. Precise descriptions shall be provided for all cements, grouts, filter packs, seals, etc., to include specific compositions, trade names, depths of placement as well as any other pertinent details. The volumes of these materials used in the construction of a well shall also be reported.

- Well development/purging procedures shall be documented for each well. This shall be summarized on the well log or on an accompanying page. Important information to be included are the type of pump used in development, pumping rate, volume of water removed from the well, duration of well development and any water quality parameters (i.e., TDS, conductivity, pH) measured during the well development.

- For wells installed using mud-rotary techniques it is particularly important to provide an estimate of the amount of mud lost into the formation. The depth at which significant volumes of mud are lost to the formation shall also be recorded.

Presenting Geophysical Investigation Results

- Maps shall be provided that clearly show the locations of the geophysical stations/traverse lines and their relationship to potential contaminant source areas.

- All details relating to types of geophysical instruments used, their use in the field (i.e. instrument spacing, QA/QC measurements, interference, etc.) and any other information that may impact the geophysical data such as solar/magnetic storms shall be reported.

- All raw, uninterpreted data used to support document conclusions shall be provided in the appendices. A complete explanation shall be provided as to how the raw data was manipulated/corrected in developing the geophysical conclusions.

- A surveyor report shall be included in the appendices if the geophysical stations/traverse lines were surveyed.

- The effective depth of exploration and limitations for each geophysical technique shall be clearly defined. A calculation shall be provided, to show how the depth of exploration was determined.

- The possible cause of all significant geophysical anomalies and their relationship to known or suspected contaminant source areas shall be discussed.

- The contractor shall correlate geophysical data with other data available for the site. For example, if an electromagnetic survey is conducted in order to help define the extent of contaminated groundwater, conductivity measurements taken from monitor wells located in the area of geophysical exploration could be used to corroborate/explain the results of the geophysical study.

- Geophysical anomalies due to sharp topographic changes (this would effect an electromagnetic survey) or interference from trucks, power lines and fences shall be identified and explained.

Identifying Conditions Warranting Immediate Removal Action

- A discussion shall be provided of any conditions that may warrant a immediate removal action to protect human health or the environment. Examples of this type of situation would be leaking drums, leaking underground or above storage tanks, a liquid filled lagoon with a weakened berm, potentially explosive conditions and evidence of contaminated drinking water wells. As much detail as possible shall be provided in the report so that the feasibility of conducting an immediate removal action can be evaluated.

C. Site Characteristics. This section of the report shall cover the following areas:

1. Geology
2. Hydrogeology
3. Meteorology
4. Demographics and Land Use
5. Ecological Assessment

The following guidelines shall be followed in presenting the discussion of site characteristics:

- Regional Hydrogeologic Frameworks

  - The development of a regional hydrogeology section will begin with a review of available United States Geological Survey, United States Department of Agriculture and/or state agency bulletins or publications that provide information on the area of interest. If regional geologic, surface soil maps, aquifer thickness and groundwater elevation maps are available through these agencies, the relevant portions of these maps shall be reproduced in the report and properly referenced. The legend/explanation for these maps shall also be accurately reproduced so that all map symbols and notations can be easily understood. The discussion shall focus on regional hydrogeologic information relevant to the site. For example, little time shall be devoted to discussing bedrock structure, geochemistry and tectonic history if bedrock aquifers are thousands of feet below the site and are not within the scope of the investigation.

  - Regional discussions shall focus on characterizing those factors that control or impact groundwater flow patterns and/or groundwater quality. Detailed discussions of the timing and mechanisms of tectonic events, specific modes of deposition shall be avoided because these issues are often highly controversial and belong more to the realm of academic research. The discussion shall focus on how the physical characteristics of the regional hydrogeologic framework relate to site-specific contamination problems.

  - Regional patterns of groundwater use by public and private wells and their potential impact on contaminant migration patterns shall be discussed. All statements/information regarding regional hydrogeology shall be fully referenced. It may be appropriate to provide excerpts from key reports as an appendix.

- Site Hydrogeologic Frameworks

  - It is essential that the development of a site hydrogeologic framework be based primarily on site-specific information. The hydrogeologic framework shall be defined in descriptive terms based on subsurface sediment/lithologic characteristics, groundwater quality information and potentiometric data. Regional stratigraphic frameworks, although important in developing an understanding of the site geology, shall not be used to define the hydrogeologic framework of the site. Formal stratigraphic nomenclature is often based on factors other than lithology, grain size or permeability. In some cases the recognized boundary, depth or thickness of a regional stratigraphic unit has no bearing whatsoever on hydrogeologic units or groundwater contaminant migration. Any key point of a conceptual hydrogeologic framework must be supported by the data collected as part of the report and/or previous reliable site-specific investigations. The use of prior investigations conducted by Potentially Responsible Parties (PRP) without state or federal oversight may not be appropriate for a variety of reasons. Well logs, soil boring logs and test pit logs, including all logs from previous investigations, shall be included in the report appendices. A structure contour map of top of bedrock shall be considered if bedrock structure controls groundwater flow patterns of the subsurface zone of interest.

- Glacial till shall never be assumed to be impermeable. Fractures, common in glacial tills, can provide efficient pathways for contaminant migration. The term "aquitard" and "aquiclude" shall not be utilized in reports. These terms are not very useful in that their meanings are not well defined. The United States Geological Survey recommends that the term "confining unit" be used instead of the terms "aquitard", "aquiclude", and "aquifuge" (USGS Open-File Report 86-534, Aquifer Nomenclature Guidelines). The definition of an "aquitard" is a unit which is relatively less permeable. Therefore, a medium grain sand unit below a unit of coarse sand and gravel could be accurately referred to as an aquitard. Although this may be technically correct, it is not very useful in describing the potential for contaminant migration because a medium grained sand would not present a barrier to groundwater flow. Many non-technical reviewers interpret the word "aquitard" to represent an impermeable layer that will protect deeper aquifer zones from becoming contaminated. The terms semi-confining unit and confining unit are more appropriate terms to use to describe less permeable units in environmental hydrogeologic investigations.

- The term "confining unit" shall be used only when it has been clearly established that the confining unit and the hydrogeologic units below it are unaffected by site-related contaminants and/or potentiometric head data indicates that the unit serves as a hydraulic barrier to vertical groundwater flow. Clays and glacial tills are commonly referred to as confining units. However, fractures in clays and glacial tills can serve as effective pathways for contaminant migration. Shelby tube analyses and slug test methods do not measure fracture porosity in till and clays. Therefore, a clay or till unit shall not be assumed to form an impenetrable barrier to downward migration of groundwater contamination based of laboratory on slug test data alone.

- Groundwater shall not be assumed to discharge completely to nearby streams or surface waters without vertical hydraulic gradient information from well clusters located near the stream/lake, surface water flow information and other forms of supporting information. A mass balance equation shall be developed which accounts for precipitation, evapo-transpiration, groundwater discharge, etc., to determine if such an assumption is reasonable. State and Federal agencies shall be consulted to determine if stream gauge and/or water quality information is available for surface waters under investigation.

- Lineament/fracture trace analyses based on aerial/satellite imagery must be fully documented if they are to serve as reliable indicators of potential trends of fracture porosity in bedrock aquifers. Good copies of all photographs and/or other imagery shall be provided to the EPA project manager. Linear features (lineaments) observed on aerial photographs cannot be assumed to be representative of fractures in bedrock. Many factors must be considered in developing a meaningful fracture trace analysis for a site. Scale, altitude, time of year, cultural influences, lighting angle and direction are all factors which can effect the type and/or the orientation of lineaments that can be detected using aerial photographs and/or satellite imagery. Field measurements of bedrock fractures at the outcrops scale shall be compared to the results of lineament analyses as well as major trends recognized in regional geologic investigations.

- A brief summary of the hydrogeologic framework for a site shall be provided to the EPA project manager and EPA technical support staff for review before the text of the first draft document is developed. It is essential to resolve issues such as the number of aquifer units, the presence or absence of confining units and the direction of groundwater flow at a site before the numerous maps, tables, and

figures are developed to provide for general agreement on these issues prior to the submittal of this summary.

- ✦ Accurate geologic cross sections shall be developed as part of any hydrogeologic investigation.

- Potentiometric Contour Maps

  - ✦ All groundwater elevations/potentiometric values shall be expressed in terms of mean sea level elevations.

  - ✦ A potentiometric map shall be developed for each aquifer zone for which there are groundwater elevation measurements from three or more wells. The base map used to develop potentiometric maps shall show topographic contours, roads, surface waters, drainage features, site boundary and potential/known groundwater contaminant source areas, residential areas and any other significant cultural features.

  - ✦ Potentiometric maps shall represent only one round of groundwater level measurements. Potentiometric values shall not be averaged over a number of rounds of groundwater elevation measurements.

  - ✦ The date and time when the groundwater measurements were obtained shall be stated in the map's title block.

  - ✦ The elevations of surface waters in the immediate vicinity of the map shall be indicated on the map. Surface water elevation measurement points shall be indicated on the map.

  - ✦ A table shall be used to provide the exact time that each water level measurement was made, depth to water from the measuring point, mean sea level elevation of groundwater, surveyed elevation of the measuring point, and surveyed elevation of ground surface for each well.

  - ✦ The wells used to develop a particular map shall be indicated with a larger or bolder symbol so that they clearly stand out from other wells screened in different aquifer units. The mean sea level elevation of groundwater for each well shall be indicated in bold type next to each well.

  - ✦ Groundwater elevation data from wells for which no well log descriptions and/or construction log is available shall not be used on potentiometric maps.

  - ✦ In areas where water table elevations are significantly influenced by tidal forces, a round groundwater measurements shall be obtained over the shortest possible period of time. Continuous groundwater level recorders provide the best record of tidal influences on groundwater levels and allows investigators to develop maps of groundwater levels at any particular instant of time over the measurement period. If continuous water level records are available, they shall be provided in the text or in the appendices.

D. Nature and Extent of Contamination. This section of the RI report shall cover the following subject areas:

1. Contaminant Sources. A full description, utilizing all pre-existing information shall be provided for each potential contaminant source area within a site investigation area. A discussion shall include the following points: dimensions, depth below grade, depth to

water table, waste volume, type of wastes/products, construction/demolition/closure dates, regulatory history, past/existing permits, historical changes in use or configuration, and available environmental sampling results. A full description shall be provided for all former structures and/or potential sources of contamination which may not be visible today as a result of construction and/or demolition activities.

2. Contaminant Distribution and Trends.

3. Site-Specific Background Levels for Environmental Media.

    a. Site-specific background levels for inorganic and other parameters shall be determined for soil, groundwater, surface water and sediment. Only information that relates directly to the site locale shall be used to develop background levels. It is inappropriate to use studies which discuss average values of these parameters found on Earth or in eastern North America. High levels of certain inorganics, chromium for example, may be common in countries or states where certain minerals are abundant. However, these average soil levels cannot be compared to soil levels in an area where these minerals are not naturally occurring or where they occur at only very low levels. Location specific background information can often be found by consulting USGS, USDA, state geologic survey. These data shall be summarized in a table in the report.

    b. Whenever possible background soil samples collected at or near the site shall be considered to be the most appropriate sampling results to use to develop background levels. Care shall be taken to ensure the soil type at the background locations is the same as the soil type at the contaminated areas under investigation. Natural levels of inorganics and other parameters in soils can be quite different across a site depending on the soil type. The USDA Soil Conservation Survey is probably the best source of soil classification maps and other soil information.

    c. A table shall be provided which summarizes the soil background levels for the site. The table shall indicate the source of the background level information.

    d. Physical properties of site contaminants such as density, solubility, and mobility (K_ow) shall be discussed in relation to patterns of contaminant transport. A table shall be used to summarize this information. Co-solvent effects shall be considered in evaluating the potential mobility of contaminants in the environment. Many contaminants such as certain pesticides are relatively immobile. However, if they are mixed with other chemicals prior to or during their disposal their mobilities can be significantly increased. A review of historical records and memos may provide valuable information regarding on-site chemical formulation processes or waste disposal practices which may have resulted in increased mobilities for certain contaminants. In these cases it may not be appropriate to use a laboratory determined mobility factor (Kow) for a particular individual contaminant. Other factors that may effect contaminant migration such as colloidal transport, groundwater pH and redox potentials shall also be considered.

    e. The potential for a floating (less dense than water) or deep (denser than water) layer of non aqueous phase liquid (NAPL) contaminants shall be considered if it is known or suspected that large quantities of liquid, pure phase contaminants have been disposed of at a site. In these cases it is important to establish whether or not monitor well screens are properly located to intercept these two types of non-aqueous phase groundwater contamination.

f. The levels of particular groundwater contaminants shall be compared with their solubilities. If contaminant levels exceed ten percent of their solubility limit, this may indicate that a pure phase of the product may be present in the subsurface. If groundwater contaminant levels exceed the solubility limit then it is clear that a pure phase of the product exists either as a layer of pure product or in a colloidal form. No assumptions shall be made regarding the valence state of inorganic contaminants if only "total" analyses have been performed. For example, no conclusions shall be made regarding whether or not chromium detected in a groundwater sample is Cr^{+3}, Cr^{+4}, Cr^{+5} and/or Cr^{+6} if only total chromium analyses have been conducted.

g. When discussing groundwater/surface water analytical results the text and tables shall state if the samples were filtered or unfiltered. Risk Assessments for Superfund documents are normally based on unfiltered analyses. Filtered results shall only be used after consulting with the EPA WAM.

h. The discussion of the nature and extent of site-related contaminants shall focus on those contaminants that pose the most significant risk to human health and the environment and exceed state or federal ARARs. Contaminants that occur at the highest levels do not necessarily pose the greatest health risk (e.g., iron and calcium). Therefore, discussions of site-related contamination shall not focus solely on those contaminants that occur at the highest levels. The relative solubilities of the contaminants also control the levels at which they can occur in groundwater.

i. Care shall be taken when comparing past sampling results to those of recent sampling to ensure that the same sample collection methods, analytical methods and protocols were used in the previous rounds of sampling. If different methods were used, the various sampling rounds cannot be compared quantitatively because differences in sample collection methods, equipment, detection limits and analytical methods can significantly effect analytical results. Therefore, only qualitative conclusions shall be drawn regarding relative changes in contamination levels over time if the data base consists of several different sampling events which used different sample collection/analytical protocols and methodology.

E. Fate and Transport. This section of the RI shall discuss:

1. Contaminant Characteristics
2. Transport Processes
3. Contaminant Migration Trends
4. Groundwater/Soil Contaminant Isoconcentration Plume Maps

a. Isoconcentration maps of site-related contaminants shall be developed to summarize RI groundwater sampling results. These maps will enable investigators and reviewers to quickly evaluate the extent and levels of site-related groundwater contamination and to make decisions regarding the need for additional monitor wells, the scope of groundwater remediation strategies and the potential threat to off-site groundwater sources. The number and types of isoconcentration maps that will be required for a site will depend on the nature of the site contamination. A total volatile organics and total semi-volatile organics isoconcentration maps shall be developed if these types of contaminants exceed state or federal action levels. Isoconcentration maps for specific site-related inorganic groundwater contaminants which exceed ARARs shall also be considered.

b. Isoconcentration maps shall be considered for any contaminant or group of site-related contaminants that occur at high levels and/or pose a relatively high risk to human health or the environment. Isoconcentration maps shall be developed for each aquifer zone so that the nature and lateral extent of groundwater contamination in different aquifer zones can be easily compared.

c. All residential wells, surface water discharge points or public supply wells shall be indicated on a contaminant isoconcentration map. Annotations shall be provided along the margin of the map that indicate the distance and direction to important public water supply well fields or industrial wells that do not fall within the map boundary.

d. All available well sampling information shall be utilized in developing an isoconcentration map. Groundwater sampling results from other sources such as local public health department residential well sampling shall be utilized if available. Different symbols shall be used to show these well locations and the map explanation shall identify the source of this information.

e. A summary of sampling results from other sources shall be provided in the text. This summary shall discuss sampling parameters, sampling/analytical methodology and detection limits.

f. All indicators of the probable extent of the groundwater contaminant plume shall be considered when developing contaminant isoconcentration maps. These factors to be considered include geophysical survey results, the contaminant source area locations, historical information, subsurface boring descriptions of contamination below the water table, subsurface soil sampling results and the direction of groundwater flow. For example, if an unlined lagoon is the source of a groundwater contaminant plume, the outer boundary of the plume shall include the entire lagoon area. It would be inappropriate to draw the plume boundary as passing through the center of the lagoon. Computer contouring often results in an inadequate product because the programs do not incorporate all the relevant factors that shall be considered when developing a contour map. In such cases the data shall be contoured by hand.

g. The degree of confidence of various sections of an isoconcentration map can be indicated with solid lines (high confidence), dashed lines (low confidence) and dotted lines or question marks (very low confidence).

h. Interpretations Regarding the Nature and Extent of Site-Related Contamination.

Probably the most important task involved in understanding site-related contamination is to integrate all available information to develop a full understanding of the site. Although it is often appropriate to discuss soil, groundwater, contaminant source material analytical sampling results in separate sections, at some point it is necessary to compare and contrast the levels and types of contaminants found in the source areas versus those found in related soils and downgradient groundwater.

Valid sampling results from previous investigations shall be considered when developing an interpretation of site-related contamination. This is particularly important if these previous investigations sampled locations or analyzed for parameters not included in the current investigation. It would be inappropriate to ignore contamination "hot spots" identified by previous studies or suspected "hot spots" based on historical information simply because the current investigation did not address certain locations.

The vertical and lateral extent of site-related contamination must be accurately reported. The text shall clearly describe the limits of our understanding of the extent of contamination if sampling efforts have not defined the vertical and lateral extent of contamination. For example, statements such as "groundwater contamination extends to a depth of 45 feet below surface" would be inappropriate if no groundwater samples are available below 45 feet. Therefore, any data gaps in our understanding of the extent of contamination shall be clearly defined and recommendation shall be made as to what additional sampling would be required to determine the extent of contamination.

F. Summary and Conclusions. The contractor shall prepare the summary and conclusions of the RI report in accordance with the following guidelines:

1. Figure Guidelines
   a. The original source of each figure shall be referenced. If a pre-existing figure has been modified, the figure shall indicate the original source of the figure which has been modified.

   b. The area of interest shall be enlarged to fill as much of the available space on the page/plate as possible.

   c. All units, symbols, patterns and scales used on figures must be fully explained in a key provided on the figure.

   d. Key figures/tables shall be inserted in the text following the page on which they are first referenced.

   e. All text and symbols used on maps, tables and figures shall be legible. To avoid data loss during reproduction nothing in a original shall be smaller than 17 characters per inch (CPI).

   f. Page numbers shall be given to figures so that they can be easily located or replaced in the text.

   g. Well Identification numbers shall indicate the depth interval or hydrogeologic zone that they are screened in. For example, D-1 might indicate deep well number one and S-7 might indicate shallow well number seven. The designation of depth zones and well identification numbers shall be consistent throughout the various phases of an investigation. Residential Wells shall be referred to by an alpha-numeric system such as RES-1. A table shall be included which provides the street address and any construction/operational information on these wells. Family names shall not be used to refer to residential wells because property owners/renters can change.

2. Map Format

   a. All maps must include an accurate north arrow, scale, a title explaining the purpose of the map, an explanation of all symbols/notations. A reference shall be provided to the source of the map if it is based on a pre-existing map.

   b. The scale shall include both a written scale and a graphical scale. The inclusion of a graphical scale is essential because its accuracy will be retained even if the map is deliberately or inadvertently enlarged or reduced through reproduction processes. A written scale would no longer be accurate once a map has been enlarged or reduced.

   c. At least one base map with a map scale of one inch equals fifty or one hundred feet shall be utilized to accurately show the location of environmental sampling locations

relative to known source areas, topographic contours, site boundary and other important features. Several maps could be utilized if the site consists of several source areas spread over a large area.

d. The surveyor's reference point/benchmark shall be identified on the map and discussed in the text.

e. Text and numbers shall be oriented on the map so that north arrow is pointing in an upward direction as one reads the map. The orientation of text and numbers relative to north shall be consistent from map to map throughout the report.

f. All units, symbols and patterns used on the map shall be fully described in an explanation included on the map. For groundwater elevation or groundwater contaminant level values, the map explanation shall state exactly how the map values were derived. The date that the data was collected shall be indicated if the data is representative of a certain point in time.

g. The map title and figure/plate number shall be shown in large bold type so that the ap can be quickly identified.

3. Presenting Analytical Results

a. Tables of analytical results shall be organized in a logical manner such as by sample location number, sampling zone, or some other logical format. For example, groundwater sampling results could be separated into three sets of data, upgradient, on-site, and downgradient. Groundwater analytical results could be separated into groups based on the hydrogeologic framework such as shallow aquifer upgradient, deep aquifer upgradient, shallow aquifer downgradient and deep aquifer downgradient. Well identification numbers within each set could be ordered according to whatever alpha-numeric system is used for the well identification numbers. Surface/subsurface soil analyses could be separated according to site location or specific contaminant source and background areas.

b. Analytical results shall not be ordered by laboratory identification numbers because these numbers do not correspond those used on sample location maps. The sample location/well identification number shall always be used as the primary reference for the analytical results. The sample location number shall also be indicated if the laboratory sample identification number is used.

c. Analytical tables shall indicate the sample collection dates.

d. The detection limit shall be indicated in instances where a parameter was not detected.

e. Analytical results shall be reported in the text, tables and figures using a consistent convention such as μg/l for groundwater analyses and mg/kg for soil analyses.

4. Discussion of Laboratory/Field Blank Contamination

a. The lead agency's protocol for eliminating field sample analytical results based on laboratory/field blank contamination results shall be clearly explained.

b. Discussion of approved sampling results shall not be qualified by suggesting that a particular chemical is a common lab contaminant or was detected in the lab blank. If the reported result has passed QA/QC it shall be considered valid. In cases where the chemical in question was known to have been used and/or disposed of on site,

positively identified at high levels in other environmental media, and passes QA/QC protocols, the sampling results shall not be questioned as being due to laboratory contaminants.

c. Field equipment rinsate blank analyses results shall be discussed in detail if decontamination solvents are believed to have contaminated field samples.

9.2 Final RI Report. After EPA review of the draft RI Report, the contractor shall incorporate EPA comments and submit the final RI Report.

Task 10 Remedial Alternatives Screening

This task includes work efforts to develop appropriate remedial alternatives to undergo full evaluation. The alternatives are to encompass a range including innovative treatment technologies consistent with the regulations outlined in the NCP, 40 CFR Part 300, and the Guidance for Conducting Remedial Investigations and Feasibility studies under CERCLA (OSWER Directive 9355.3-01 and other OSWER Directives including 9355.4-03, October 18, 1989, and 9283.1-06, May 27, 1992, "Considerations in Ground Water Remediation at Superfund Sites") or more recent guidance, policies or procedures.

The contractor shall investigate only those hazardous waste management alternatives that will remediate or control contaminated media (soil, surface water, ground water, sediments) remaining at the site, as deemed necessary in the RI, to provide adequate protection of human health and the environment. The potential alternatives shall encompass, as appropriate, a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes but vary in the degree to which long-term management of residuals or untreated waste is required, one or more alternatives involving containment with little or no treatment; and a no-action alternative. Alternatives that involve minimal efforts to reduce potential exposures (e.g., site fencing, deed restrictions) shall be presented as "limited action" alternatives.

10.1 Prepare Draft Technical Memorandum. The contractor shall prepare a draft Technical Memorandum presenting the potential alternatives and including the following information:

- Establish Remedial Action Objectives. Based on existing information, the contractor shall identify site-specific remedial action objectives which should be developed to protect human health and the environment. The objectives should specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals).

- Establish General Response Actions. The contractor will develop general response actions for each medium of interest by defining contaminant, treatment, excavation, pumping, or other actions, singly or in combination to satisfy remedial action objectives. The response actions should take into account requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characteristics of the site.

- Identify & Screen Applicable Remedial Technologies. The contractor shall identify and screen technologies based on the developed general response actions. Hazardous waste treatment technologies should be identified and screened to ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics will be considered. This screening will be based primarily on a technology's ability to effectively address the contaminants at the site, but will also take into account a technology's implementability and cost. The contractor will select representative process options, as appropriate, to carry forward into alternative development. The contractor will identify the need for treatability testing for those technologies that are probable candidates for consideration during the detailed analysis.

- Develop Remedial Alternatives in accordance with NCP.

- Screen Remedial Alternatives for Effectiveness, Implementability, and Cost. The contractor shall screen alternatives to identify the potential technologies or process options that will be combined into media-specific or site-wide alternatives. The developed alternatives shall be defined with respect to size and configuration of the representative process options; time for remediation; rates of flow or treatment; spatial requirements; distances for disposal; and required permits, imposed limitations, and other factors necessary to evaluate the alternatives. If many distinct, viable options are available and developed, the Research Engineer will screen the alternatives that undergo the detailed analysis to provide the most promising process options. The alternatives should be screened on a general basis with respect to their effectiveness, implementability, and cost.

10.2 Prepare Final Technical Memorandum. After EPA review of the draft Technical Memorandum, the contractor will incorporate EPA comments and submit the final Technical Memorandum.

Task 11 Remedial Alternatives Evaluation

This task includes efforts associated with the assessment of individual alternatives against each of the nine current evaluation criteria and a comparative analysis of all options against the evaluation criteria. The analysis shall be consistent with the National Contingency Plan (NCP), 40 CFR Part 300 and shall consider the Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (OSWER Directive 9355.3-01) and other pertinent OSWER guidance. EPA will make the determination regarding final selection of the remedial alternative.

The nine criteria the contractor shall employ in evaluation of remedial alternatives are:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Reduction in toxicity, mobility or volume through treatment;
- Short-term effectiveness;
- Implementability - technical and administrative;
- Cost;
- State acceptance; and
- Community acceptance.

11.1 Perform Remedial Alternatives Evaluation. The evaluation shall include: (1) a technical description of each alternative that outlines the waste management strategy involved and identifies the key ARARs associated with each alternative; and (2) a discussion that profiles the performance of that alternative with respect to each of the evaluation criteria. The contractor shall provide a table summarizing the results of this analysis. Once the individual analysis is complete, the alternatives will be compared and contrasted to one another with respect to each of the evaluation criteria.

11.2 Final Technical Memorandum. After EPA review of the draft Technical Memorandum, the contractor shall incorporate EPA comments and submit the final Technical Memorandum.

Task 12 FS Report

The Contractor shall prepare and submit a Feasibility (FS) Report consisting of a detailed analysis of alternatives and cost-effectiveness analysis in accordance with the NCP, 40 CFR Part 300, as well as the most recent guidance.

12.1 Prepare Draft FS Report

The contractor shall prepare a draft FS report and submit to EPA according to the schedule in the RI/FS work plan. To expedite the development of the FS report, the contractor shall maintain close contact with the EPA WAM and provide draft chapters of the FS report for review as they are developed.

The FS Report shall contain the following:

- Feasibility Study Objectives;
- Remedial Objectives;
- General Response Actions;
- Identification & Screening of Remedial Technologies;
- Remedial Alternatives Description;
- Detailed Analysis of Remedial Alternatives. The contractor's technical feasibility considerations shall include any problems that may prevent a remedial alternative from mitigating site problems. Therefore, the site characteristics from the RI must be kept in mind as technical feasibility of the alternative is studied. Specific items to be addressed are reliability, safety, operation and maintenance, ease with which the alternative can be implemented, and time needed for implementation; and
- Summary and Conclusions.

12.2 Prepare Final FS Report. After EPA review of the draft FS Report, the contractor shall incorporate EPA comments and submit the final FS Report.

Task 13 Post RI/FS Support

13.1 The contractor shall provide technical support required for preparation of the ROD for the site, excluding those activities already addressed under Task 2 of this SOW. The contractor's support shall include the following activities: attendance at public meetings, briefings and technical meetings with review of presentation materials, technical assistance on review and presentation of draft and final Responsiveness Summary and Proposed Plan and ROD, and preparation and review of draft and a final Feasibility Study Addendum covering issues arising after finalization of the basic RI/FS documents. The contractor's support may include the following support activities:

13.1.1 The contractor will prepare a draft and final addendum to the Feasibility Study (based upon EPA comments) covering issues arising after the finalization of the basic FS document.

Task 14 Negotiation Support [not used]

Task 15 Administrative Record [not used]

Task 16 Work Assignment Closeout

Upon notification from EPA, that the technical work under the work assignment is complete, the contractor shall perform the necessary activities to close out this work assignment in accordance with contract requirements.

16.1 Work Assignment Closeout Report (WACR). The contractor shall prepare a Work Assignment Closeout Report (WACR). The WACR shall include all LOE by p-level and costs in accordance with the WBS.

16.2 Document Indexing. The contractor shall organize the work assignment files in their possession in accordance with the current approved EPA file index structure [e.g., Administrative Record Index , EPA Superfund Site File Index, and/or ARCS Guidelines for Closeout of Work Assignment (June 1991). For the Superfund program, Section 113(k)(1) of CERCLA as amended by SARA, requires EPA to establish an Administrative Record (AR) which contains all the information the Agency considers in selecting a response action. The AR for the selection of a remedial action or response decision must be made available for public inspection at the commencement of the remedial investigation phase (when the RI/FS work plan is approved). The format to be used in compiling ARs is outlined in a memorandum from Don R. Clay, former Assistant Administrator, OSWER, entitled "Final Guidance on Administrative Records for Selecting CERCLA Response Actions," dated December 3, 1990.

16.3 Document Retention/Conversion. The contractors shall convert all relevant paper files into an appropriate long-term storage format. EPA will define the long term storage format prior to the closeout of the work assignment. For budget purposes, assume that long-term storage format will be compact disk.

ATTACHMENTS

Attachment 1. **Summary of Major Submittals for the Remedial Investigation and Feasibility Study at the Diamond Head Oil Site**
Attachment 2. **Regulation and Guidance Documents**
Attachment 3. **Transmittal of Documents for Acceptance by EPA**
Attachment 4. **Transmittal Register**

Attachment 1
Summary of Major Submittals for the Remedial Investigation/Feasibility Study at the Diamond Head Oil Site

TASK	DELIVERABLE	NO. OF COPIES	DUE DATE (calendar days)
1.1.4.1	RI/FS Work Plan	5	30 days after receipt of work assignment
1.1.4.2	Revised RI/FS Work Plan	5	Within 15 days after receipt of EPA comments
1.2.1	Site Management Plan (SMP)	3	30 days after approval of RI/FS Work Plan
1.2.1.1	Pollution Control and Mitigation Plan	3	30 days after approval of RI/FS Work Plan
1.2.1.2	Transportation and Disposal Plan	3	30 days after approval of RI/FS Work Plan
1.2.2	Health & Safety Plan	3	30 days after approval of RI/FS Work Plan
1.2.3.1	Quality Assurance Project Plan	3	30 days after approval of RI/FS Work Plan
1.2.3.2	Field Sampling Plan	3	30 days after approval of RI/FS Work Plan
1.2.3.3	Data Management Plan	3	30 days after approval of RI/FS Work Plan
1.2.4	Conceptual Model (RAGS Table 1)	3	30 days after approval of RI/FS Work Plan
1.2.4	Pathways Analysis Report	3	30 days after receipt of all analytical results from laboratory
1.3.2.2	Work Assignment Closeout Report	3	45 days after receipt of Work Assignment Completion Notification
2.0.2	Community Interview Questions	3	30 days after approval of RI/FS Work Plan
2.0.1	Community Interview Summaries	3	Within 15 days of the last interview
2.1.1	Draft Community Relations Plan	3	Within 30 days of the last interview
2.1.2	Final Community Relations Plan	3	Within 15 days of EPA comments
2.2.5	Public Meeting Transcript	5	Within 30 days of the public meeting
5.5.3	Data Validation Report	3	30 days after receipt of all analytical results from laboratory
6.4	Data Evaluation Summary Report	3	60 days after receipt of all analytical results from laboratory
7.1.1	Draft Human Health Risk Assessment Report	3	30 days after submittal of PAR
7.1.2	Final Human Health Risk Assessment Report	3	15 days after receipt of EPA comments
7.2.1.3	Conceptual Exposure/Pathway Analysis (Tech Memo)	5	30 days after approval of RI/FS Work Plan
7.2.1	Draft Ecological Risk Assessment Report	3	90 days after approval of RI/FS Work Plan
7.2.2	Final Ecological Risk Assessment Report	3	15 days after receipt of EPA comments
9.1	Draft Remedial Investigation (RI) Report	3	30 days after submittal of PAR
9.2	Final RI Report	3	15 days after receipt of EPA comments
10.1	Draft Remedial Alternatives Technical Memorandum	3	45 days after completion of field investigations
10.2	Final Remedial Alternatives Technical Memorandum	3	15 days after receipt of EPA comments
11.1	Draft Remedial Alternatives Evaluation	8	(#) days after completion of Remedial Alternatives Technical Memorandum
	Final Remedial Alternatives Evaluation	3	

Attachment 1
Summary of Major Submittals for the Remedial Investigation/Feasibility Study at the Diamond Head Oil Site (continued)

TASK	DELIVERABLE	NO. OF COPIES	DUE DATE (calendar days)
12.1	Draft Feasibility Study Report	3	(#) days after completion of RI
12.2	Final Feasibility Study Report	3	(#) days after receipt of EPA comments
	Document Conversion/Retention		Within 60 days of FDO letter with final award fee

Attachment 2
Regulations and Guidance Documents

The following list, although not comprehensive, comprises many of the regulations and guidance documents that apply to the RI/FS process:

1. American National Standards Practices for Respiratory Protection. American National Standards Institute Z88.2-1980, March 11, 1981.

2. ARCS Construction Contract Modification Procedures September 89, OERR Directive 9355.5-01/FS.

3. CERCLA Compliance with Other Laws Manual, Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, August 1988 (DRAFT), OSWER Directive No. 9234.1-01 and -02.

4. Community Relations in Superfund - A Handbook, U.S. EPA, Office of Emergency and Remedial Response, June 1988, OSWER Directive No. 9230.0-3B.

5. A Compendium of Superfund Field Operations Methods, Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, EPA/540/P-87/001a, August 1987, OSWER Directive No. 9355.0-14.

6. Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, U.S. EPA, Office of Solid Waste and Emergency Response, October 1986, OSWER Directive No. 9472.003.

7. Contractor Requirements for the Control and Security of RCRA Confidential Business Information, March 1984.

8. Data Quality Objectives for Remedial Response Activities, U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA/540/G-87/003, March 1987, OSWER Directive No. 9335.0-7B.

9. Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, U.S. EPA Region IV, Environmental Services Division, April 1, 1986 (revised periodically).

10. EPA NEIC Policies and Procedures Manual, EPA-330/9-78-001-R, May 1978, revised November 1984.

11. Federal Acquisition Regulation, Washington, DC: U.S. Government Printing Office (revised periodically).

12. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, U.S. EPA, Office of Emergency and Remedial Response, October 1988, OSWER Directive NO. 9355.3-01.

13. Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potential Responsible Parties, U.S. EPA Office of Emergency and Remedial Response, EPA/540/G-90/001, April 1990.

14. Guidance on Expediting Remedial Design and Remedial Actions, EPA/540/G-90/006, August 1990.

15. Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, U.S. EPA Office of Emergency and Remedial Response (DRAFT), OSWER Directive No. 9283.1-2.

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Attachment 3

TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA		DATE:	TRANSMITTAL NO.
TO:	FROM:		☐ New Transmittal ☐ Resubmittal of Transmittal No. _____

SUBTASK NO.	DELIVERABLE	NO. OF COPIES	REMARKS

ACCEPTANCE ACTION

DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)	NAME/TITLE/SIGNATURE OF REVIEWER DATE

300136

Attachment 4

TRANSMITTAL REGISTER								
PROJECT TITLE AND LOCATION				CONTRACT NO.			WORK ASSIGNMENT NO.	
Subtask No.	DELIVERABLE	No. of Copies	Due Date	Transmittal No.	Date Received	Date Comments Sent to Contractor	EPA Acceptance Date	REMARKS

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Amendment to the Statement of Work for Remedial Investigation/Feasibility Study

Diamond Head Oil, Keraney, New Jersey
Dated February 1, 2002

The following is the agreed to approach for the development of the work plan as a result of the Scoping Meeting held May 22, 2002 for Work Assignment No. 112-RICO-02KK under Contract No. 68-W6-0036:

RI/FS Approach

- The Diamond Head RI/FS will be performed in two phases. A Phase 1 remedial investigation will be performed to obtain information in areas where there is currently no information on site contamination; to delineate the LNAPL in the former lagoon area; and to investigate subsurface soils and groundwater at the site. The results of the Phase 1 investigation will be used to define the objectives and scope of the Phase 2 investigation.

- The tasks listed below will take place during both the Phase 1 and 2 remedial investigations.

  Task 1 Project planning
  Task 2 Community relations
  Task 3 Remedial Investigation
  Task 4 Sample analysis
  Task 5 Analytical Support and Data Validation
  Task 6 Data Evaluation

- The following tasks will be performed after completion of the Phase 2 investigation: Tasks 7-16. (Note Task 7 will partially be performed at the end of the Phase 1 investigation in order to provide screening-level risk information that can be used in defining the objectives and scope of the Phase 2 investigation). Since the objectives and scope for these tasks are dependent on the results of the Phase 1 investigation, a scope and cost for these tasks (except for the Task 7 activities to be performed at the end of Phase 1) will be developed after completion of the Phase 1 investigation and at the time when the objectives and scope for the Phase 2 investigation are being developed.

- The preparation of the Diamond Head RI/FS Work Plan will follow the phased approach of the remedial investigation with a Phase 1 Work Plan presenting the scope and costs for implementing the Phase 1 investigation and a Phase 2 Work Plan presenting the scope and costs for implementing the Phase 2 investigation and Tasks 7-16.

- Attachment 1 reflects the deliverables during Phase 1.

Specific changes to the tasks listed in the SOW are described below.

Task 1 Project Planning and Support

1.2.4 Pathway Analysis Report – This report will be prepared as part of Task 7 (section 7.1.1) based on both the Phase 1 and 2 data after the Phase 2 investigation has been completed.

1.3.2 Work Assignment Closeout – This subtask will be performed as part of Task 16.

Task 2 Community Relations

2.0 Community Interviews – Not required at this time

2.1 Community Relations Plan – The community relations plan will be developed based on typical concerns which may be expected in an industrial site setting. The plan will be revised to include specific concerns expressed by the community during the public meeting. The repository will be at the County Library.

2.2 Public Meeting Support – Contractor will attend 2 public meetings and provide display materials and hand-outs for the meetings. Additional support will be provided on an as-requested basis.

2.3 Fact Sheets Preparation – Contractor will provide support on an as-requested basis.

2.4 Proposed Plan Support – This subtask will not be required.

2.5 Public Notices – This subtask will not be required.

2.6 Responsiveness Summary Support – This subtask will not be required.

Task 3 Field Investigation

3.1 Mobilization

Structural evaluation of the building will not be required as part of this subtask.

3.2 Field Investigation

3.2.1 Perform Site Reconnaissance

The following will not be required as part of the Phase 1 investigation: Topographical and property boundary survey, well inventory, and residential and municipal well sampling.

3.2.2 Conduct Geological Investigations

The following will not be required as part of the Phase 1 investigation: Test pit installation.

3.2.3 Conduct Hydrogeological Investigations

The following will not be required as part of the Phase 1 investigation: Hydraulic pump tests.

3.2.4 Conduct Waste Investigations - Not required at this time

3.2.8 Conduct Ecological Investigation

Phase 1 will include an assessment of the need to perform the ecological evaluations in the SOW. These evaluations may or may not need to be performed during Phase 2.

3.2.4 Collect and analyze contaminated building samples - Not required at this time

Task 4 Sample Analysis

This task will not be required at this time as field analysis of samples will not be performed and all samples for CLP analysis will be analyzed through the CLP program. Costs for laboratory analysis of samples outside of the CLP program will be included under Task 3.

Task 5 Analytical Support and Data Validation

5.3 Data validation

Validation of analytical results for samples analyzed through the CLP program will be performed by EPA. The results of samples analyzed outside of the CLP program will not be used for the purpose of risk assessment but only for evaluation of alternatives. Therefore, the results for these samples will be reviewed by a chemist to ensure that the data is not rejected but full validation following EPA's functional guidelines will not be required.

Task 6 Data Evaluation

6.4 Technical Memorandum

The Technical Memorandum will present the results of the Phase 1 investigation and make recommendations on the need for and overall scope for a Phase 2 investigation.

A draft TM will be prepared and revised to address EPA's comments.

Contractor will attend 2 meetings: one to discuss the Phase 1 results and TM contents and one to discuss the recommendations on the need for a Phase 2 investigation.

Task 7 Assessment of Risk

7.1 Human Health Risk Assessment

The Human Health Risk Assessment will be prepared in two phases as follows:

End of Phase 1

- Based on the Phase 1 data, prepare RAGS Part D standard tables 1 and 2 (the selection of exposure pathways and selection of chemicals of potential concern).
- Tables will be submitted as part of the Phase 1 Technical Memorandum.
- The data collected during Phase 1 and validated historical data will be used to complete screening assessment.
- The scope of these activities will be included in the Phase 1 Work Plan.

End of Phase 2

- Based on the Phase 1 data, prepare RAGS Part D standard tables 1 and 6 and the Pathway Analysis Report.
- The data collected during Phase 1 and 2 and validated historical data will be used to prepare Tables 1-6.
- After EPA's review and comment, prepare complete human health risk assessment.

7.2 Ecological Risk Assessment

The Ecological Risk Assessment will be prepared in two phases as follows:

End of Phase 1

- Steps 1 through 3 will be conducted following completion of the Phase 1 investigation.
- Steps 4, 5 and 6 will be completed as part of planning for the Phase 2 site investigation (if determined to be necessary to further address ecological risk at the completion of Step 3).
- The scope of these activities will be included in the Phase 1 Work Plan.

End of Phase 1

- Steps 7 and 8.

Tasks 8 – 16

These tasks will be completed after the Phase 2 investigation. A scope for these activities will not be prepared for the Phase 1 Work Plan.

Attachment 1
Summary of Major Submittals for Phase 1 of the Remedial Investigation/Feasibility Study at the Diamond Head Oil Refinery Site

TASK	DELIVERABLE	NO. OF COPIES	DUE DATE (calendar days)
1.1.4.1	RI/FS Work Plan – Phase 1	5	June 26, 2002
1.1.4.2	Revised RI/FS Work Plan – Phase1	5	Within 15 days after receipt of EPA comments
1.2.1	Site Management Plan (SMP)	3	30 days after approval of RI/FS Work Plan
1.2.2	Health & Safety Plan	3	30 days after approval of RI/FS Work Plan
1.2.3	Sampling and Analysis Plan	3	30 days after approval of RI/FS Work Plan
6.4	Phase 1 Technical Memorandum	3	60 days after receipt of all analytical results from laboratory
7.1.1	Draft Human Health Risk Assessment Report – RAGS Tables 1 and 2	3	60 days after receipt of all analytical results from laboratory
7.2.1	Draft Ecological Risk Assessment Report – Steps 1 - 3	3	60 days after receipt of all analytical results from laboratory

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Appendix B
Tables and Figures

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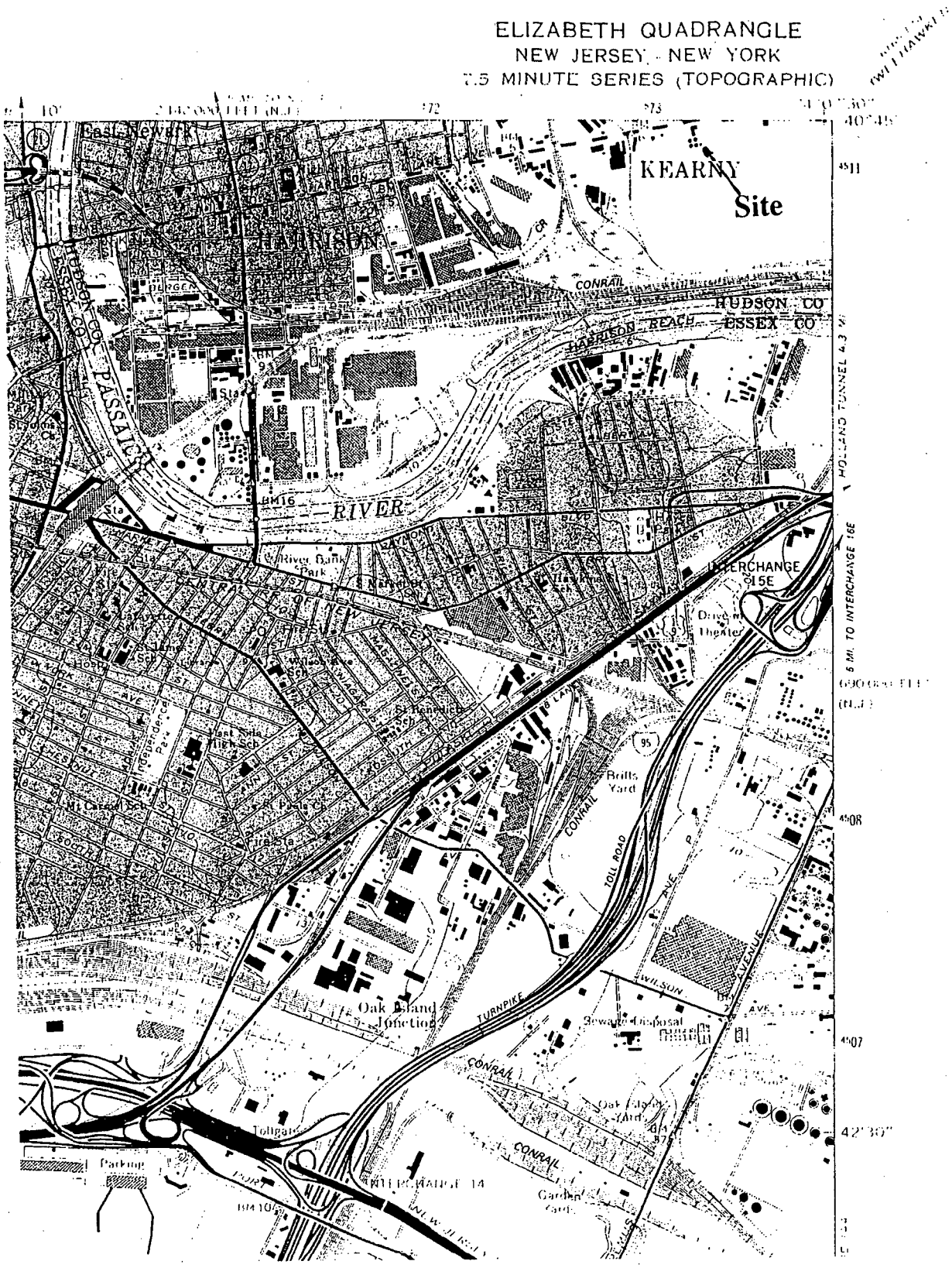

Figure A
Diamond Head Oil
Site Location Map

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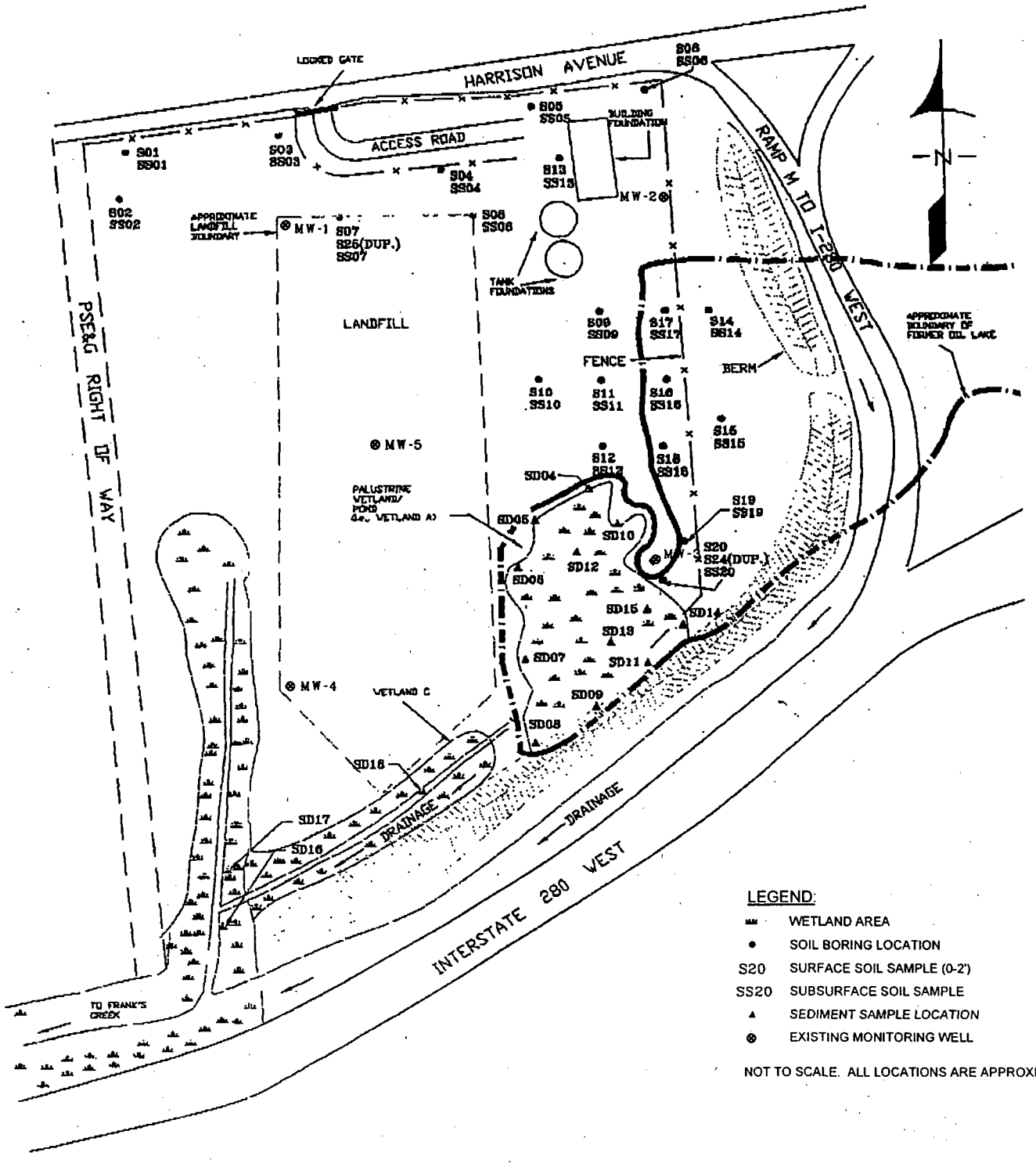

Figure B
SITE PLAN
Diamond Head Oil RI/FS

Source: Site plan based on plan in 1999 Roy F. Weston ESI

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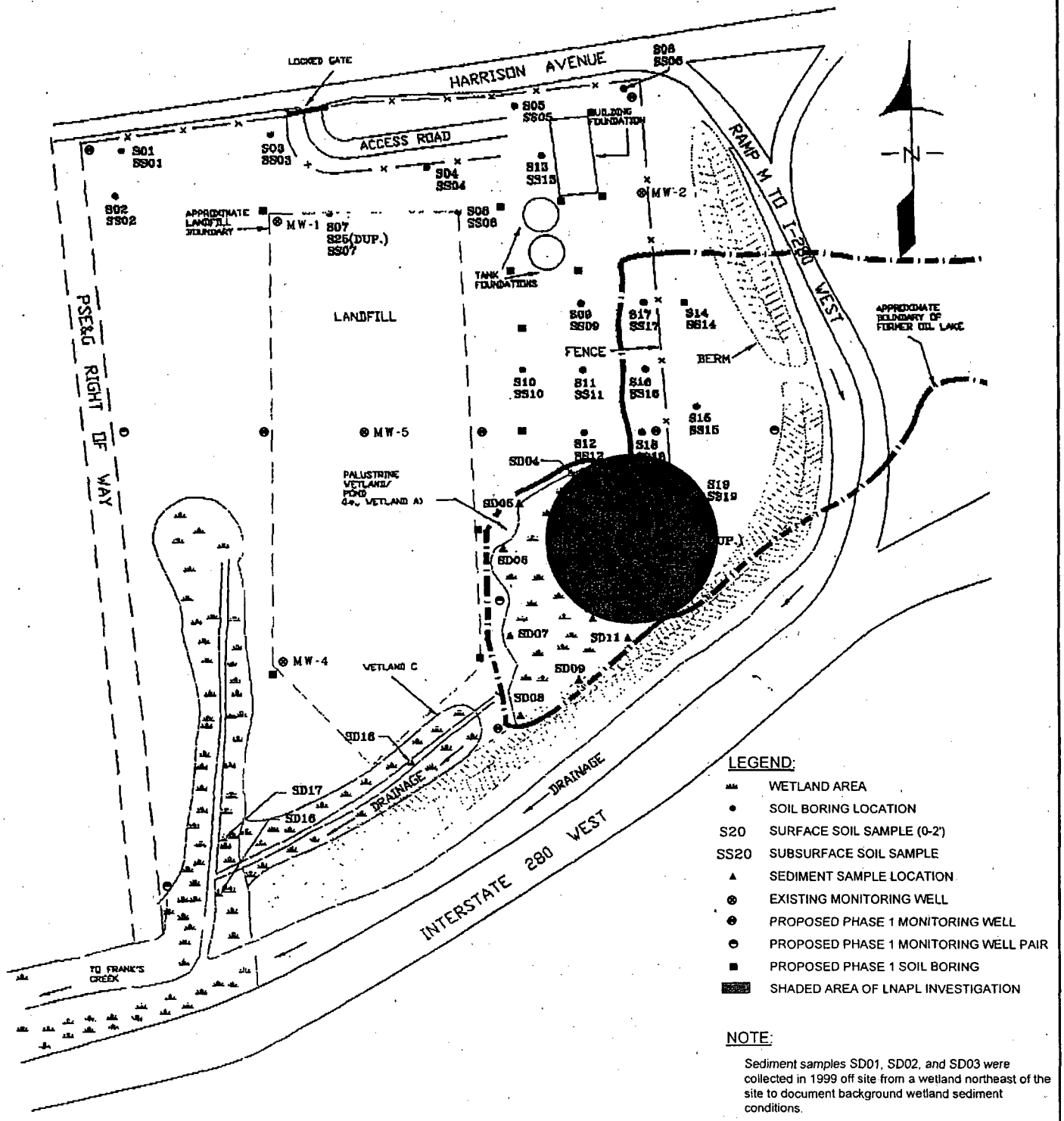

LEGEND:

- WETLAND AREA
- SOIL BORING LOCATION
- S20 SURFACE SOIL SAMPLE (0-2')
- SS20 SUBSURFACE SOIL SAMPLE
- SEDIMENT SAMPLE LOCATION
- EXISTING MONITORING WELL
- PROPOSED PHASE 1 MONITORING WELL
- PROPOSED PHASE 1 MONITORING WELL PAIR
- PROPOSED PHASE 1 SOIL BORING
- SHADED AREA OF LNAPL INVESTIGATION

NOTE:

Sediment samples SD01, SD02, and SD03 were collected in 1999 off site from a wetland northeast of the site to document background wetland sediment conditions.

NOT TO SCALE. ALL LOCATIONS ARE APPROXIMATE.

Figure C
PHASE 1 PROPOSED SAMPLING LOCATIONS
Diamond Head Oil RI/FS

Source: Site plan based on plan in 1999 Roy F. Weston ESI

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Table D
Summary of Proposed Investigation Activities for the Diamond Head Oil RI/FS
Kearny, NJ

Media	Objective of Sampling Program	Investigation Method	Selection of Sampling Locations	Drilling/ Sampling Method	Number of Investigation Locations	Depth of Investigation Method	Number of Samples per Location	Total number of samples	Sample depth	Analysis
LNAPL	Delineate extent of LNAPL and associated contamination in former lagoon area	- Install shallow subsurface soil borings extending radially from well MW-3 - Observe visually for LNAPL - Perform shake test - Screen with PID and collect soil samples - Install piezometers in the borings to observe for the thickness of LNAPL	- Borings to extend radially in 4 directions (N, E, S, W) from well MW-3 where LNAPL is currently present - 12 borings are estimated - Borings will be continued until there is no evidence of LNAPL	Rotasonic	Estimated 12	To top of peat or approx. max depth 15-20 feet	3	36	- Surface (0-6") - Mid depth - Bottom of boring	- Soil cores will be screened with PID - Field shake test for LNAPL (all jars to be retained) - Samples selected for laboratory analysis based on PID readings and evidence of LNAPL - Samples to be analyzed for TCL organics & TAL metals - LNAPL thickness measurements
	Determine the characteristics of LNAPL material	Sample the LNAPL in well MW-3	MW-3	NA	1	NA	1	1	NA	- LNAPL fingerprinting (GRO and DRO) - TCL organics & TAL metals - Hazardous waste characteristics - Full TCLP - Specific gravity
Surface and sub-surface soil	- Investigate soil contamination (surface and subsurface above as well as below the peat/native organic soil layer) in areas where data is not available from previous investigations. - Investigate soil contamination (surface and subsurface above as well as below the peat/native organic soil layer) along the boundaries of the landfill.	- Install subsurface soil borings terminating at the peat layer - Install soil borings below the peat layer to the estimated depth of the bedrock surface or apprx. 50 feet - Downhole gamma logging of the borings installed below the peat layer	- Borings in an approximate grid in areas where there is currently no information - Borings along the upgradient and downgradient boundary of the landfill where change in slope is noted - Borings along the upgradient and downgradient boundary of the site - One boring outside of the perimeter of the site to investigate general soil conditions in the vicinity of the site - Actual locations to be selected in consultation with EPA after selected paths have been cleared from vegetation	Rotasonic	27	- 23 Shallow borings to top of peat (terminal depth approx. 15-20 feet) - 4 Deep borings below the peat (terminal depth approx. 50 feet)	- Shallow borings - 3 per boring - Deep borings - 6 per boring	81	- Analyses for TCL Organics include analyses for VOCs, SVOCs, pesticides, and PCBs. If warranted, samples will be analyzed for dioxins and furans in a subsequent phase of this investigation. - Shallow borings - surface (0-6"), mid depth, bottom of boring - 4 Deep borings - surface (0-6"), mid depth of fill materials above peat, bottom of fill materials above peat, top of peat, bottom of peat, and bottom of boring	- Soil cores will be screened with PID - Samples selected for laboratory analysis based on PID readings and evidence of LNAPL - Samples to be analyzed for TCL organics & TAL metals - Samples from fill materials, peat, and soil below the peat in the deep boring along the east border of the landfill tested for engineering parameters - Note that where a deep boring is installed next to a shallow boring for the purpose of monitoring well pair installation, sampling will be performed only in the deep boring - Note that if evidence of LNAPL is noted in any borings, the shake test will be performed and the boring will be completed as a piezometer - Where possible, boring locations will be selected in a 100-foot grid.

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Table D
Summary of Proposed Investigation Activities for the Diamond Head Oil RI/FS
Kearny, NJ

Media	Objective of Sampling Program	Investigation Method	Selection of Sampling Locations	Drilling/ Sampling Method	Number of Investigation Locations	Depth of Investigation Method	Number of Samples per Location	Total number of samples	Sample depth	Analysis
Groundwater	- Investigate groundwater contamination along the upgradient and downgradient boundaries of the site and along the upgradient and downgradient boundaries of the landfill.	Install monitoring wells in: - 10 of the shallow soil borings with screens from the water table to the top of the peat - 4 deep borings with estimated 10 or 20-foot screens set at the top of the bedrock surface	Locations were selected to provide information on groundwater contamination: - Along the upgradient boundary of the site - Upgradient of the landfill and downgradient of the lagoon area - Downgradient of the landfill and the site, in general	Rotasonic	14	- 10 shallow wells (terminal depth approx. 15-20 feet) - 4 deep wells (terminal depth approx. 50 feet)	NA	NA	NA	Note that if the presence of oil is observed in a boring, the shake test will be performed and the boring will be completed as a piezometer.
		Develop the existing and new monitoring wells in preparation for sampling	NA	NA	19	NA	NA	NA	NA	
		Evaluate the tidal influence at the site	Install pressure transducers in both the shallow and deep borings in the 4 well pairs	NA	8	NA	NA	NA	NA	Water levels will be recorded continuously for a period of one week.
		Collect 2 rounds of synoptic water level and LNAPL thickness measurements in all on site wells and piezometers	NA	NA	19	NA	NA	NA	NA	Rounds of water level measurements will be collected as follows: at the time transducers are installed and removed and prior to the start of the groundwater sampling
		Collect one round of groundwater samples from existing and new monitoring wells	Sample using low-flow all existing and new monitoring wells	Low-flow	19	NA	1	19	Above and below peat	- All locations - field parameters, TCL organics & TAL metals - Samples from the well pair along the eastern boundary of the landfill for natural attenuation parameters - Field parameters will include pH, temperature, specific conductance, dissolved oxygen, turbidity, and redox potential.
Surface water and sediments	- Investigate surface water and sediment contamination in areas at the site where data is not available from previous investigations and immediately downgradient from the site	Sample surface water and sediments at selected locations	Co-located samples will be collected where data gaps appear in the existing data and to obtain an appropriate distribution of data	Hand	10	Sediment 0-6"	One surface water and one sediment per location	- Onsite - 8 samples - Downgradient of site - 2 samples		- All locations - field parameters, TCL organics & TAL metals - Note that one of the downgradient locations will be selected where depositional environment is present at the junction of Franks Creek and the drainage ditch leaving the site
Other	Clearance of vegetation	Vegetation to be cleared along select paths								

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Table D
Summary of Proposed Investigation Activities for the Diamond Head Oil RI/FS
Kearny, NJ

Media	Objective of Sampling Program	Investigation Method	Selection of Sampling Locations	Drilling/ Sampling Method	Number of Investigation Locations	Depth of Investigation Method	Number of Samples per Location	Total number of samples	Sample depth	Analysis
	Wetland delineation	Site visit for observation and delineation of wetland areas	NA	NA	NA	NA	NA	NA	NA	Delineation is important to adjsut where possible sampling locations in oreder to minimize the impacts on the wetland areas.
	Prepare site map, survey wetaln boundary, survey horizontal locations of all new sampling locations, and survey vertical elevations of new monitoring wells	- Survey work will be performed in two phases (first site map and wetland delineation, then horizontal and vertical survey)	NA	NA	NA	NA	NA	NA	NA	NA
	Clear all locations in former reprocessing area for buried metal and non-metalic conduits or containers before starting drilling	Clearance to be performed in one phase of all locations except in former lagoon area, which has been filled								
RI-derived wastes	Characterize wastes for disposal	Sample contents of storage tank where IDW water will be stored and sample drums with drill cuttings	One sample from the storage tank and upto five samples from the drums with drill cuttings	Composite	6	NA	1	6	NA	Hazardous waste characteristics for water and Full TCLP for soil cuttings

Soil engineering analyses: see table for non-CLP analyses
Groundwater field parameters will include pH, temperature, specific conductance, dissolved oxygen, turbidity, and redox potential.
Groundwater natural attenuation analyses: see table for non-CLP analyses
Analyses for TCL Organics include analyses for VOCs, SVOCs, pesticides, and PCBs. If warranted, samples will be analyzed for dioxins and furans in a subsequent phase of this investigation.

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Table E
Summary of Planned
Samples for CLP Analyses and Associated Bottle Requirements
Diamond Head Oil RI/FS
Kearny, NJ

Sampling Location	Number of locations	Number of samples at specified depth	Depth	Total number of samples	Number of QA/QC samples	Analyses	Total number of samples including QA/QC	Type of bottles	Number of bottles per sample	Total number of bottles
Soil - Shallow borings										
SB 1 - 31	31	1	0-6"	31	-	VOCs				
				31	-	semi-VOCs				
				31	-	pesticides				
				31	-	PCBs				
				31	-	metals				
			Mid depth	31	-	VOCs				
				31	-	semi-VOCs				
				31	-	pesticides				
				31	-	PCBs				
				31	-	metals				
			Bottom of boring	31	-	VOCs				
				31	-	semi-VOCs				
				31	-	pesticides				
				31	-	PCBs				
				31	-	metals				
Soil - Deep borings										
SB 32 - 36	4	1	0-6"	4	-	VOCs				
				4	-	semi-VOCs				
				4	-	pesticides				
				4	-	PCBs				
				4	-	metals				
			Mid depth of fill materials above peat	4	-	VOCs				
				4	-	semi-VOCs				
				4	-	pesticides				
				4	-	PCBs				
				4	-	metals				
			Bottom of fill materials above peat	4	-	VOCs				
				4	-	semi-VOCs				
				4	-	pesticides				
				4	-	PCBs				
				4	-	metals				
			Top of peat	4	-	VOCs				
				4	-	semi-VOCs				
				4	-	pesticides				
				4	-	PCBs				
				4	-	metals				
			Bottom of peat	4	-	VOCs				
				4	-	semi-VOCs				
				4	-	pesticides				
				4	-	PCBs				
				4	-	metals				

Table E
Summary of Planned
Samples for CLP Analyses and Associated Bottle Requirements
Diamond Head Oil RI/FS
Kearny, NJ

Sampling location	Number of locations	Number of samples at specified depth	Depth	Total number of samples	Number of QA/QC samples	Analyses	Total number of samples including QA/QC	Type of bottles	Number of bottles per sample	Total number of bottles
			Below peat	4	-	VOCs				
				4	-	semi-VOCs				
				4	-	pesticides				
				4	-	PCBs				
				4	-	metals				
TOTAL SOIL				117	23	VOCs	140	EnCore samplers and 2 oz clear glass wide mouth jar	3 samplers and 1 jar per sample	420 EnCore samplers and 152 jars
				117	23	semi-VOCs	140	8 oz amber glass wide mouth jar	1	140
				117	23	pesticides	140	8 oz clear glass wide mouth jar	1	140
				117	23	PCBs	140	Same	1	140
				117	23	metals	140	Same	1	140
				120	NA	Shake test	120	Same	1	120
Surface water										
SW 19 - 29	10	1	NA	10	-	VOCs				
				10	-	semi-VOCs				
				10	-	pesticides				
				10	-	PCBs				
				10	-	metals				
TOTAL SURFACE WATER				10	2	VOCs	12	40 ml vials with HCL	3	36
				10	2	semi-VOCs	12	2l amber glass Boston round jar	1	12
				10	2	pesticides	12	1l amber glass Boston round jar	1	12
				10	2	PCBs	12	Same	1	12
				10	2	metals	12	1l poly narrow mouth with HNO3	1	12

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Table E
Summary of Planned
Samples for CLP Analyses and Associated Bottle Requirements
Diamond Head Oil RI/FS
Kearny, NJ

ampling cation	Number of locations	Number of samples at specified depth	Depth	Total number of samples	Number of QA/QC samples	Analyses	Total number of samples including QA/QC	Type of bottles	Number of bottles per sample	Total number of bottles
ediment										
D 19 - 29	10	1	0-6"	10	-	VOCs				
				10	-	semi-VOCs				
				10	-	pesticides				
				10	-	PCBs				
				10	-	metals				
OTAL EDIMENT				10	2	VOCs	12	EnCore samplers and 2 oz clear glass wide mouth jar	3 samplers and 1 jar per sample	EnCore samplers and 13 jars
				10	2	semi-VOCs	12	8 oz amber glass wide mouth jar	1	12
				10	2	pesticides	12	8 oz clear glass wide mouth jar	1	12
				10	2	PCBs	12	Same	1	12
				10	2	metals	12	Same	1	12
roundwater										
W 1 - 5 nd W 6 - 19	19	1	Above and below peat	19	-	VOCs				
				19	-	semi-VOCs				
				19	-	pesticides				
				19	-	PCBs				
				19	-	metals				
OTAL ROUND WATER				19	4	VOCs	23	40 ml vials with HCL	3	69
				19	4	semi-VOCs	23	2l amber glass Boston round jar	1	23
				19	4	pesticides	23	1l amber glass Boston round jar	1	23
				19	4	PCBs	23	Same	1	23
				19	4	metals	23	1l poly narrow mouth with HNO3	1	23

ote: The number of QA/QC samples included in this table is an estimate set at 20% of the total number of samples that are planned to be collected at the site. If additional samples are collected based on field observations, the number of QA/QC samples may be higher than the numbers in this table.

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Table F
Summary of Planned Samples for non-CLP Analyses to be Used in Engineering Evaluations of Remedial Alternatives Diamond Head Oil RI/FS
Kearny, NJ

Number of Samples	Analyses	Analytical Method	Type of bottles	Preservation	Number of bottles per sample	Total number of bottles
Subsurface Soil						
3	TOC	SW-846 9060M	8 oz glass jar	4°C	1	3
3	Porosity	ASTM D160.3	4 oz. glass jar	NR	1	3
3	pH	SW-846 9045C	4 oz. glass jar	4°C	1	3
3	Particle size	ASTM D422-63	16 oz. glass jar	NR	1	3
3	Bulk density	ASTM D698-00	4 oz. glass jar	NR	1	3
Groundwater						
2	Alkalinity	EPA 310.1	100 ml polyethylene	4°C	1	2
2	TSS	EPA 160.2	500 ml Polyethylene	4°C	1	2
2	TDS	EPA 160.1	100 ml polyethylene	4°C	1	2
2	Hardness	EPA 130.2	100 ml polyethylene	H_2SO_4 to pH <2, 4°C	1	2
2	Total iron	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	1	2
2	Dissolved iron	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	2 (1 unpreserved and 1 preserved)	4
2	Ferrous iron	SM 3500-FE D	100 ml polyethylene	4°C	1	2
2	Dissolved Arsenic	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	2 (1 unpreserved and 1 preserved)	4
2	Ammonia	EPA 350.1	500 ml Polyethylene	H_2SO_4 to pH <2, 4°C	1	2
2	TKN	EPA 351.2	500 ml Polyethylene	H_2SO_4 to pH <2, 4°C	1	2
2	Nitrate	EPA 353.2	100 ml polyethylene	H_2SO_4 to pH <2, 4°C	1	2
2	Nitrite	EPA 354.1	100 ml polyethylene	4°C	1	2
2	Calcium	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	1	2
2	Potassium	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	1	2
2	Manganese	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	1	2
2	Phosphorous, Total	EPA 365.3	200 ml Polyethylene	H_2SO_4 to pH <2, 4°C	1	2
2	Sodium	SW-846 6010B	500 ml Polyethylene	HNO_3 to pH <2, 4°C	1	2
2	Chloride	EPA 300.0	200 ml Polyethylene	4°C	1	2
2	Sulfate	EPA 300.0	200 ml Polyethylene	4°C	1	2
2	Sulfide	EPA 376.1	500 ml Polyethylene	4°C, Zn acetate, NaOH to pH>9	1	2
2	Methane	8015B or RSK 175	40 mL glass vials	4°C	3	6
2	Ethane	8015B or RSK 175	40 mL glass vials	4°C	3	6
2	Ethene	8015B or RSK 175	40 mL glass vials	4°C	3	6
2	TOC	EPA 415.1	100 ml polyethylene	HCl to pH<2, 4°C	1	2
2	BOD	EPA 405.1	1 L Polyethelene	4°C	1	2
2	COD	EPA 410.1	100 ml polyethylene	H_2SO_4 to pH <2, 4°C	1	2
2	CO2	8015B or RSK 175	40 mL glass vials	4°C	1	2
NAPL						
1	TCL-VOCs	8260	40 ml vials	cool to 4°C	1	1
1	TCL-semi-VOCs	8270	40 ml vial	cool to 4°C	1	1
1	TCL-pesticides	8081				

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Table F
Summary of Planned Samples for non-CLP Analyses to be Used in Engineering Evaluations of Remedial Alternatives Diamond Head Oil RI/FS
Kearny, NJ

Number of samples	Analyses	Analytical Method	Type of bottles	Preservation	Number of bottles per sample	Total number of bottles
1	TCL-PCBs	8082				
1	TAL-metals	8260	40 ml vial	cool to 4°C	1	1
1	GRO & DRO	8015	40 ml vial	cool to 4°C	1	1
1	Haz waste characteristics - Ignitability	1010	40 ml vial	cool to 4°C	1	1
1	Haz waste characteristics - corrosivity	9045				
1	Haz waste characteristics - reactivity	7.3.3.2				
1	Full TCLP	1311/8000/6000	40 ml vial	cool to 4°C	2	2
1	Specific gravity	2710				
Waste Materials						
1	Haz waste characteristics - Ignitability	1010	8 oz Glass	cool to 4°C	1	1
1	Haz waste characteristics - corrosivity	9045				
1	Haz waste characteristics - reactivity	7.3.3.2				
5	Full TCLP	1311/8000/6000	4 oz Glass	cool to 4°C	1	1

Table G
Exposure Pathways to be Evaluated During the Risk Assessment
Diamond Head Oil RI/FS
Kearny, NJ

Media	Exposure Route	Current/Future	Future			
		Trespasser/Visitor	Industrial	Construction	Resident[3]	
		Adolescent	Worker	Worker	Adult	Child
Surface Soil[1]						
	Ingestion	X				
	Dermal	X				
	Inhalation	X				
Groundwater						
	Ingestion		X		X	X
	Dermal		X	X	X	X
	Inhalation		X	X	X	X
Indoor Air - from Groundwater						
	Ingestion					
	Dermal					
	Inhalation		X		X	X
Indoor Air - from Soil						
	Ingestion					
	Dermal					
	Inhalation		X		X	X
Subsurface Soil[2]						
	Ingestion		X	X	X	X
	Dermal		X	X	X	X
	Inhalation		X	X	X	X

X Quantitative evaluation.

1. Includes top 2 feet of soil.
2. Includes top 12 feet of soil.
3. Although unlikely, future residential use of the site will be evaluated.

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Attachment H

Comparison of RotaSonic to Other Available Drilling Options
Diamond Head Oil Refinery Remedial Investigation and Feasibility Study
Kearny, NJ

Drilling Technique	Estimated Cost	Advantages	Disadvantages
RotaSonic	$146,000	Excellent sample retrieval, which is crucial to meet the RI technical objectives of identifying LNAPL: • Continuous large scale core samples (4-inch diameter by 10 feet long), which will allow continuous observations for the presence of LNAPL over the entire length of the core. • Since the soil core can be opened to observe for LNAPL on the inside of the core, smearing will not be an issue. • Ample soil volume for samples and QA/QC samples, geotechnical parameters, and field analyses (shake test) Rapid drilling with fewer logistics involved for drill rig set-up – potential reductions in program duration. The RotaSonic drilling method is quicker than the hollow stem auger drilling method. The duration of the program at Diamond Head is estimated at 20 to 25 days compared to an estimated 40 to 45 days for the hollow stem auger. "Clean" drilling technique, which uses potable water as a drilling fluid, if necessary. The operations around the drilling work area remain cleaner. Use of innovative technology The drilling technique intrinsically advances casing allowing investigation above and below the target peat layer using the same equipment. The volume of IDW is reduced, which in turn reduces disposal costs. There are fewer cuttings, and they are generally dry (i.e., no mud), which makes handling/storage easier.	Higher cost than conventional drilling methods, which are compensated by the reduced labor time. Total cost for the RotaSonic program is estimated at $146,000, which is higher than the estimated $117,000 cost for hollow stem auger. The estimated duration of the RotaSonic program, however, is approximately 20 to 25 days compared to 40 to 45 days for the hollow stem auger. *Limited number of drilling companies provide this service (most are from out of state). Because of that, there is the potential for* longer down time if the specialized portions of the rig break (although drill company generally maintains a large inventory of replacement parts and staffs the work crew with a certified mechanic, drill rig is also mounted on a standard truck chassis). If out-of-state drilling company is used, the mobilization is from a greater distance (Ohio or Massachusetts/Minnesota), which causes higher mobilization cost. If out-of-state drilling company is used, drill crews and CH2M HILL staff work 10-day shifts with 4-day rest periods in order to minimize mobilization costs.
Hollow Stem Auger	$117,000	Traditional drilling technique, which has been used successfully in the anticipated subsurface conditions.	Limited soil retrieval and the potential for missing LNAPL: • Split spoon core samples are of small size – 2-inch diameter by 24-inch length.

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Attachment H

Comparison of RotaSonic to Other Available Drilling Options
Diamond Head Oil Refinery Remedial Investigation and Feasibility Study
Kearny, NJ

Drilling Technique	Estimated Cost	Advantages	Disadvantages
		The technique allows for blow counts, which provide some screening-level geotechnical information. Multiple drilling companies are available for bids, including local drilling companies. Potential for easier acquisition of drill rig replacement parts in the event of a breakdown. Traditional work schedule for the field crew – 5 days per week. Because local drilling companies are available, mobilizations are shorter. Note that since selection is through a competitive bidding process, there are no guarantees that a local driller would be selected. Total cost for the hollow stem auger program is estimated at $117,000, which is lower than the estimated $146,000 cost for the RotaSonic drilling method. The estimated duration of the RotaSonic program, however, is approximately 20 to 25 days compared to 40 to 45 days for the hollow stem auger.	• This smaller size permits only limited observations with smear zones on the outside of the soil samples. Since the core cannot be opened to observe for LNAPL on the inside, a clear identification of the start and end depth of any observed LNAPL will not be possible. • Some retrieved sample in split spoon sampler may contain collapsed material from the borehole wall. • Limited soil volume for environmental sampling and QA/QC samples – may need to re-drill to re-sample target interval and sample volume may be limited for the performance of the shake test. • Higher potential for lack of data/observations/samples due to "No Recovery" in discrete split spoon sample interval. When this occurs, observations for LNAPL may not be performed over entire 24-inch split spoon interval. More logistical set-up required at each drilling location. Operation in work area requires more time and effort for IDW containment. The actual drilling time using hollow stem auger is higher than for the RotaSonic drilling method. The duration of the hollow stem auger program is estimated at 40 to 45 days compared to an estimated 20 to 25 days for the RotaSonic program. The mobilization time between drilling locations is also higher. Both result in additional time for the driller and CH2M HILL's field crews in comparison to the RotaSonic drilling method. The volume of IDW is higher than that generated from the RotaSonic drilling method, which results in higher disposal costs and additional logistics and time for the field crews for its handling/separation/storage. Additional outer drill casing will have to be advanced to allow the investigation to proceed below the target peat layer.

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Attachment H

Comparison of RotaSonic to Other Available Drilling Options
Diamond Head Oil Refinery Remedial Investigation and Feasibility Study
Kearny, NJ

Drilling Technique	Estimated Cost	Advantages	Disadvantages
Direct Push/ Geoprobe		Innovative drilling technique with lower cost than other drilling technologies. Multiple drilling companies are available for bids including local drilling companies. Potential for easier acquisition of drill rig replacement parts in the event of a breakdown. Traditional work schedule for the field crew – 5 days per week. Because local drilling companies are available, mobilizations are shorter. Note that since selection is through a competitive bidding process, there are no guarantees that a local driller would be selected.	Limited soil retrieval and the potential for missing LNPAL: • Core samples are of small size -1.5-inch diameter by 48-inch length. • This smaller size permits only limited observations with smear zones on the outside of the soil samples. Since the core cannot be opened to observe for LNAPL on the inside, a clear identification of the start and end depth of any observed LNAPL will not be possible. • Extremely limited soil volume for environmental sampling and QA/QC samples – may need to re-sample target interval and volume may be limited for the performance of the shake test. • Higher potential for lack of data/observations/samples due to No Recovery in acetate sleeve sample interval. When this occurs, observations for LNAPL may not be performed over entire 48-inch sample interval. • Subsurface conditions often limit probe penetration depths. Gravel, construction debris, well-sorted sands, or stiff clays may stop the probe. Lacks "muscle" that may be needed to achieve deeper sample depths; there is a loss of associated time attempting to retrieve samples. A location may need to be probed multiple times prior to achieving the terminal depth. The method does not provide opportunity to transform the soil boring into a well for future monitoring purposes.

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